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ART OF HEATING

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TÜV SÜD

Art of heating

COMPANY PROFILE

LAC Company Ltd. has been a successful manufacturer and marketer of industrial furnaces, dryers and refractory castable shapes for more than two decades and has a strong presence in both in domestic as well as foreign markets. Since its establishment in 1992, the company has manufactured more than 12,000 furnaces.

The products are designed for applications in a wide range of heat treatment and technological processes and are particularly suited to the following:

- Heat treatment of ferrous and non-ferrous metals in metallurgy
- Heat treatment and chemical-heat treatment metal processing
- Heat treatment for metal-shaping and welding processes
- Low-temperature applications
- Alloy technologies for non-ferrous metals
- Laboratory technologies
- Industrial production of glass and industrial ceramics
- Production of hobby glass and ceramics

The LAC manufacturing program includes the manufacture of a complete standard range of furnace and dryer lines, and also accommodates the individual requirements of the customer through the design and manufacture of atypical furnaces tailor-made to meet customer specifications. In response to ever-increasing global energy prices, LAC has begun to actively implement energy audits through which energy losses are identified, thus helping customers to significantly reduce energy costs.

The LAC development and design office works in tandem with a team of service technicians to ensure quality service to customers and pave the way for future company growth. LAC technological development has also progressed to include the fulfilment of NADCAP standard contracts for the aircraft and defence industries.

A significant part of the LAC business is the manufacture of refractory castable shapes, the bulk of which are used in the manufacture of industrial furnaces. Refractory castable shapes are also used by metallurgy companies and manufacturers of boilers for burning wood, pellets, and biomass. LAC is presently one of the largest manufacturers of refractory concrete shaped blocks in Europe. In 2012 LAC completed a 1,2 mil. € expansion of the LAC refractory castable shapes production facilities.

The company also supplies heating elements, refractory and insulation materials, regulating elements, and reconstruction of furnaces, heating systems and switchboards to its customers. The rapid growth of the company is illustrated by its present 200 employees, capital assets of 480,000 €and 25,000 m2 of production, warehousing and company administration facilities. In 2012 the company re-certified its quality management system to meet the new standard ČSN EN ISO 9001:2009. In 2008 LAC opened a sales branch in China.

SUMMARY

LOW-TEMPERATURE APPLICATIONS

HIGHT-TEMPERATURE APPLICATIONS

Electric dryer with chain converter

This dryer is for the tempering of welded plastic components to remove stress (automotive tail lights). The furnace conveyer is designed paternoster style for maximum space utilization and requires significantly less space, compared to standard conveyor furnaces. The conveyor is vertical, which shortens the length of the material flow in the manufacturing process and also simplifies handling. The lights are loaded onto the paternoster conveyor shelves manually through the input door and after processing, they are removed through the output door on the opposite side of the furnace. The conveyor moves upward in pre-set steps, moving the conveyor up and away from the input door. The shelves are held in a horizontal position throughout the process, thus eliminating the risk of damage due to improper or uneven shelf loading. Atmosphere circulation within the furnace is synced with the conveyor so that the charge temperature remains within the proscribed limits as it moves though the first heating zone, and then the soak and the cooling processes.

The furnace is custom-made to meet the individual customer's requirements, with the shelf size and charge handling system designed according to charge type and characteristics. The conveyor construction system of shelves on set frames in paternoster style allows maximum for utilization of space (See conveyor design sketch).

The flexibility achieved through use of this type of conveyor furnace is can be seen in applications for the preheating and hardening of transformer molds in which each shelf bearing load is up to 450kg (w x h x d) 2300 x 500 x 800 mm with 10-shelf capacity in the furnace for a maximum furnace charge load of 4500 kg.

This furnace may be designed for a maximum temperature of up to 350°C upon request.

S 4200/35 Drawing: Conveyor system (sketch)

DRYER SV 4200/35

Preheating of electric motor stator

Technical parameters:

- Outer dimensions (w x h x d): 1900 x 4800 x 2200 mm
- Load-bearing surface of shelf: (w x h x d): 480 x 460 x 400 mm
- Number of shelves in furnace: 12 pcs
- Max. temperature: 350°C
- Input: 40 kW
- Place and year of installation: Czech Republic, 2011

DRYER SV 58000/01

Curing of transformers

Technical parameters:

- Outer dimensions (w x h x d): 4700 x 5800 x 3000 mm
- Load-bearing surface of shelf: (w x h x d): 2300 x 680 x 840 mm
- Number of shelves in furnace: 10 pcs
- Max. temperature: 100°C
- Input: 55 kW
- Control system: PLC Siemens
- Place and year of installation: Czech Republic, 2011

SV 4200/35

DRYER SV 19500/01

Tempering of automobile lights

Technical parameters:

- Outer dimensions (w x h x d): 3200 x 6100 x 2700 mm
- Load-bearing surface of shelf: (w x h x d): 840 x 360 x 800 mm
- Number of shelves in furnace: 19 pcs
- Production capacity: 1 pc /60–70 sec = 200 000 pcs/year
- Input: 45 kW
- Control system: PLC Siemens
- Place and year of installation: Czech Republic, 2010

SV 195000/01 Atypical I.

SV 195000/01 Atypical II.

DRYER SV 28900/01

Tempering of automobile lights

Technical parameters:

- Outer dimensions (w x h x d): 5690 x 5100 x 2510 mm
- Load-bearing surface of shelf: (w x h x d): 3100 x 360 x 600 mm
- Number of shelves in furnace: 25 pcs
- Production capacity: 130 lights/hour
- Max. temperature: 100°C
- Input: 37 kW
- Control system: PLC Siemens
- Place and year of installation: Czech Republic, 2010

DRYER S 9200/01

Preheating of automobile dashboard components

Technical parameters:

- Outer dimensions (w x h x d): 2600 x 6100 x 2900 mm
- Load-bearing surface of shelf: (w x h x d): 1700 x 500 x 750 mm
- Number of shelves in furnace: 4 pcs
- Production capacity: 800 pcs/24 hrs
- Max. temperature: 100°C
- Input: 30 kW
- Control system: PLC Siemens
- Place and year of installation: Czech Republic, 2006

Continuous electric furnaces with conveyor belt

Dryers with conveyor belt are suitable for the continuous heat treatment of parts. The parts are placed on an aluminum pallet which is then placed onto the wire mesh conveyor belt for transport through the furnace. As required, the racks may also be designed as an integral part of the belt so that the parts can be loaded directly onto the conveyor belt itself. Manipulation of the charge can be done either automatically or manually.

Conveyor dryers are designed for the heat treatment of parts at temperatures of 80°C to 350°C. It is possible to sync the conveyor movement in individual sections of the dryer to match the heating process temperature profile requirements and allow for the gradual temperature increase of the components.

A cooling tunnel in which the charge on the conveyor is treated with cool air flow may be added to the dryer. Additionally, if cooling to very low temperatures is needed at the outlet of the cooling tunnel, an additional cooling unit may be fitted. As in the furnace, the conveyor and cooling speed may be regulated and set to meet temperature profile requirements. The furnace and cooling tunnel layout may be set for maximum utilization of space with the charge loaded into the furnace input point next to the charge exit point from the cooling tunnel.

The dryer and cooling tunnel may be equipped with charge thermocouples to oversee the maximum or minimum temperature of the charge being heated or cooled. Additionally, the dryer may also be designed with contract-free charge surface measuring units placed at various points.

The type and design of the conveyor are set to customer specification based on charge type, heat treatment requirements and cleanliness of the surrounding environment. The equipment may also be integrated into a fully-automatic process with robotic charge manipulation between work stations if precise charge placement onto the conveyor and conveyor resistance to temperature changes can be assured. Manipulation of the charge between the furnace and the cooling tunnel can also be realized using a dedicated manipulator. This solution is cost-effective, fully-functional and provides maximum space utilization.

LAC has also implemented solutions for the heat processing of aluminum and steel pistons in which the pistons are placed directly onto the conveyor using dryers of this type. An additional application is the curing of potting compound on electric sensors for the automotive industry with the charge placed onto pallets and the entire pallet then handled by robot and manipulator.

SP 2200/15

SP 2800/15

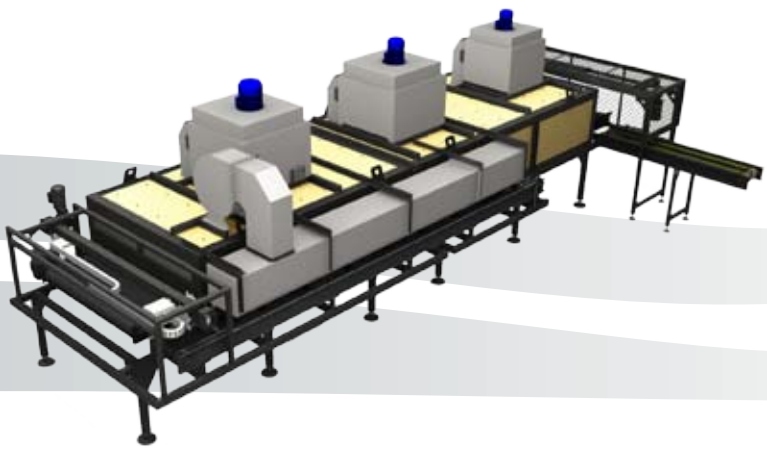
SP 3900/15

CONTINUOUS DRYER SP 2200/15

Hardening of plastic components for automobile dashboards

Technical parameters:

- Outer dimensions (w x h x d): 2200 x 2450 x 7500 mm
- Furnace conveyor length: 6800 mm
- Cooling conveyor length: 3800 mm
- Max. temperature: 150°C
- Input: 30 kW
- Control system: PLC Siemens
- Charge: sensors on aluminum pallets
- Production capacity: 1 000 000 pcs/year
- Place and year of installation: Czech Republic, 2010

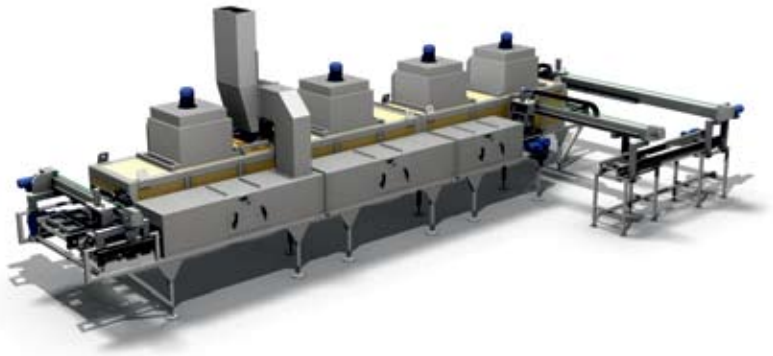


CONTINUOUS DRYERS SP 1200/15

Hardening of potting compound in sensors for cars

Technical parameters:

- Outer dimensions (w x h x d): 4200 x 3400 x 9950 mm
- Furnace conveyor length: 9500 mm
- Cooling conveyor length: 7400 mm
- Max. temperature: 150°C
- Input: 55 kW
- Control system: PLC Siemens
- Charge: sensors on aluminum pallets
- Production capacity: 180 pallets/hour
- Place and year of installation: China, 2011

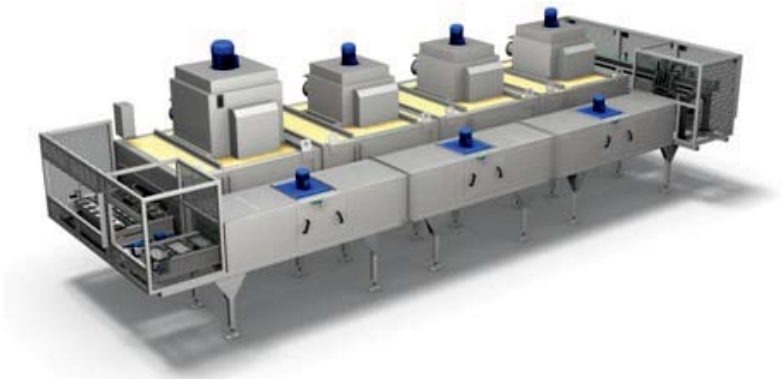


CONTINUOUS DRYERS SP 2800/25

Heat treating the graphite layer on automotive piston rims after graphitization

Technical parameters:

- Outer dimensions (w x h x d): 3350 x 2400 x 8800 mm
- Furnace conveyor length: 8300 mm
- Cooling conveyor length: 8300 mm
- Max. temperature: 200°C
- Input: 85 kW
- Control system: PLC Siemens
- Charge: aluminum alloy pistons
- Production capacity: 1 piston/22 seconds
- Place and year of installation: Russia, 2012

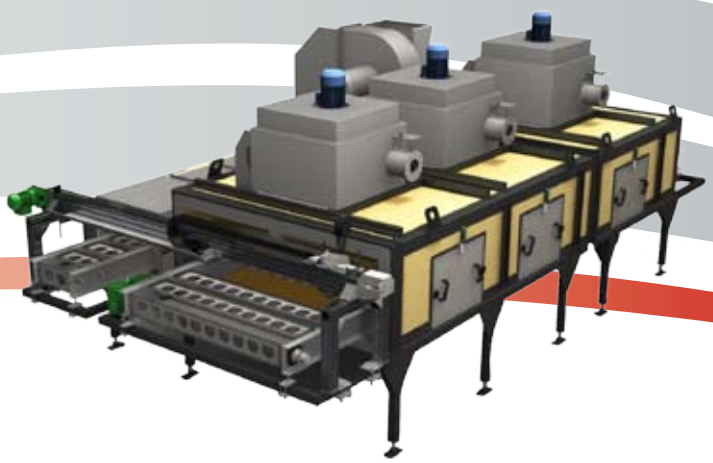


CONTINUOUS DRYERS SP 3900/02

Heat treating the graphite layer on automotive piston rims after graphitization

Technical parameters:

- Outer dimensions (w x h x d): 3300 x 2400 x 6000 mm
- Furnace conveyor length: 5800 mm
- Cooling conveyor length: 5800 mm
- Max. temperature: 200°C
- Input: 45 kW
- Control system: PLC Siemens
- Charge: aluminum alloy pistons
- Production capacity: 1 piston/13 seconds
- Place and year of installation: Poland, 2011



CONTINUOUS DRYER SP 76800/25

Drying the moisture from noodle shape kaolin

This machine is designed especially for drying the moisture from noodle shape kaolin, the device is connected with a line for processing kaolin. It is a continuous type of a furnace with three belt conveyors with wired belts that are located one over the other. The kaolin is dried by hot air of up to 250°C that runs over the conveyors belts. The kaolin is heated up by one monoblock burner with the output of 220kW and it is placed in the burning chamber where the combustion products are mixed with cold air to reach the desired temperature. After passing through the furnace the combustion products are also used for carrying the moisture out.

The device works in a full automatic mode, the kaolin is dosed equally onto the upper conveyor on which it passes through the furnace in the forward direction. From this upper conveyor it falls on the middle conveyor which carries the kaolin in the opposite direction and finally it falls onto the lower conveyor. It passes through the furnace for the last time and before it leaves the furnace it is cooled down by a stream of cold air. The kaolin comes out at the furnace exit where the furnace is attached to other parts of the line. There is another conveyor under the furnace in case some kaolin falls through or off the wire belt. The device is able to dry up to 4t of kaolin per hour.

Technical parameters:

- Outer dimensions (w x h x d):2600 x 2700 x 19000 mm
- Furnace conveyor length: 63m
- Furnace conveyor width: 1470 mm
- Max. temperature: 250°C
- Max burner power: 2200 kW
- Fuel: Light fuel oil
- Control system: PLC Siemens
- Place and year of installation: Vietnam, 2010

Burning chamber

Electric continuous dryers for glass treatment

Many technologies and manufacturing processes require the handling of plates of glass. LAC has manufactured many types of electric tunnel dryers with conveyors specially designed for the handling and transport of glass.

The dryers are constructed with ceiling ventilating units to maintain different temperatures in the various heating sections of the furnace and also to synchronize the conveyor movement to ensure the correct heat treatment process on the charge.

As glass plates have very low height, the overall furnace size is reduced accordingly. This creates very intense heat transfer between the batch and the heating elements, thus reducing thermal losses and lowering operating costs.

The charge is cushioned by rubber supports as it lays on the conveyor. The placement of the supports may be changed to meet the customer's needs. This solution facilitates manipulation of the charge by a robot and also allows the customer to make changes of the batch placement according to the charge type. If manual handling is required, support frame templates which allow the user to clearly define the position of the glass on the conveyor may be used. At operation begin, the frames will automatically move to their pre-defined positions without affecting the smooth operation of the conveyor.

This type of furnace is used for the production of photovoltaic panels and also for the hardening of adhesives and coatings on the edges of automobile glass.

SP 3400/15

CONTINUOUS DRYER SP 5200/02

Hardening of photovoltaic panels

Technical parameters:

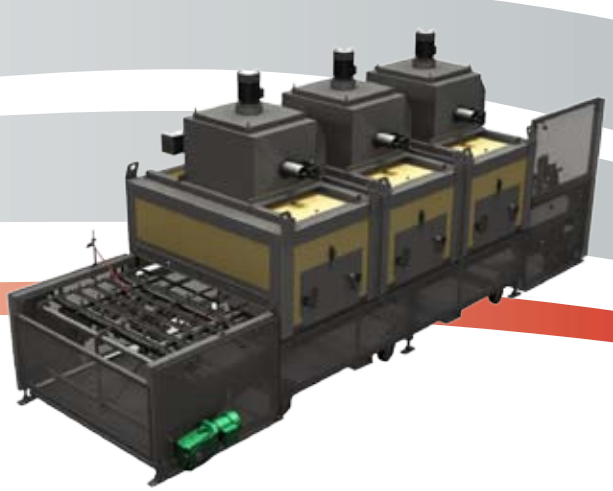
- Outer dimensions (w x h x d): 2100 x 2400 x 16000 mm
- Clearance profile: (w x h): 1700 x 180 mm
- Furnace conveyor length: 15500 mm
- Max. temperature: 200°C
- Input: 90 kW
- Control system: PLC Siemens
- Charge: photovoltaic panels
- Place and year of installation: Czech Republic, 2008

CONTINUOUS DRYER SP 3400/15

Automobile glass preheating

Technical parameters:

- Outer dimensions (w x h x d): 2000 x 2500 x 5700 mm
- Clearance profile: (w x h): 1300 x 300 mm
- Furnace conveyor length: 5100 mm
- Max. temperature: 150°C
- Input: 60 kW
- Control system: PLC Siemens
- Charge: front and side windows of cars
- Production capacity: 80 glasses/hour
- Place and year of installation: Czech Republic, 2010



Electric continuous dryer with suspended conveyor

This type of dryer is designed for use with a suspended conveyor. It is suitable for areas with limited space or for processes in which the charge cannot be set down or mustn't be in contact with other surfaces. The dryer is continuous, with the charge input at one end and output at the other. To minimize heat loss at the open ends, the equipment may also be fitted with sliding or hinged doors that are only open for the amount of time needed to move the charge in or out of the furnace. The heating and fan units installed in the ceiling ensure even heating and air circulation throughout the furnace. Thermocouples and contactless temperature sensors may also be built into the dryer to check the temperature of the charge. There are single and multi-zone heating options, and as with standard continuous conveyor furnaces, the speed of suspended conveyor movement through each zone may be set and regulated in order to meet individual heat treatment process requirements.

SP 2000/15, SP 8800/07

Among the many custom options available, the charge may be moved through the furnace using a gravity conveyor with individual batches discharged from the furnace at set time intervals.

Another non-standard solution was provided to a customer to meet the heat processing needs of the curing of epoxy composite on pressure vessels. In this case, the dryer was equipped with a special flue for the removal of the condensation that forms during the epoxy curing process. As this post-hardening condensation also has the side-effect of disturbing all moving mechanisms in the equipment, it was necessary to locate the conveyor above the furnace workspace. A sophisticated ceiling air circulation curtain system was installed to create a circulation passage above the conveyor for reduction of heat loss as the conveyor passed through the ceiling hangers.

CONTINUOUS DRYER SP 5700/02

Curing of pressure vessels

Technical parameters:

- Outer dimensions (w x h x d): 1500 x 2700 x 13400 mm
- Furnace conveyor length: 20 400 mm
- Max. temperature: 200°C
- Input: 90 kW
- Charge: pressure vessels
- Place and year of installation Czech Republic, 2008

CONTINUOUS DRYER SP 1100/15

Drying of automobile components for dashboards with applied adhesive

Technical parameters:

- Outer dimensions (w x h x d): 1400 x 2800 x 2200 mm
- Max. temperature: 150°C
- Input: 18 kW
- Control system: PLC Siemens
- Charge: plastic frames for insertion inside car doors
- Production capacity: 180 pcs/hour
- Place and year of installation Czech Republic, 2008

CONTINUOUS DRYER SP 2000/15

Drying of automobile components for dashboards with applied adhesive

Technical parameters:

- Outer dimensions (w x h x d): 1500 x 2600 x 1500 mm
- Max. temperature: 150°C
- Input: 23 kW
- Control system: PLC Siemens
- Charge: plastic frames for insertion inside car doors
- Production capacity: 270 pcs/hour
- Place and year of installation Czech Republic, 2008

CONTINUOUS DRYER SP 5700/07

Drying of automobile components for dashboards with applied adhesive

Technical parameters:

- Outer dimensions (w x h x d): 1650 x 3100 x 6400 mm
- Max. temperature: 70°C
- Input: 18 kW
- Control system: PLC Siemens
- Charge: plastic frames for insertion inside car doors
- Production capacity: 120 pcs/hour
- Place and year of installation Czech Republic, 2008

CONTINUOUS DRYER SP 8800/07

Drying of automobile components for dashboards with applied adhesive

Technical parameters:

- Outer dimensions (w x h x d): 1300 x 2600 x 7100 mm
- Max. temperature: 70°C
- Input: 18 kW
- Control system: PLC Siemens
- Charge: plastic frames for insertion inside car doors
- Production capacity: 120 pcs/hour
- Place and year of installation Czech Republic, 2008

Chamber dryers

This type of equipment boasts modular design that allows the customer maximum flexibility in space utilization. Its main advantages include the variability of outer shell dimensions and the possibility to adjust the useable inner dryer space according to charge type and dimension.

Description of dryer design:
Chamber dryers are outfitted with single-hinged or double doors, according to size and type. The doors are hung on a frame and open to the side. Continuous dryers have two sets of doors. A single-handed lever opening system is used for hinged doors and door opening may also be done hydraulically or pneumatically with push-button or foot pedal regulation.

Heating is done with heating elements. In smaller dryer types, these heating bodies are located directly inside the inner distribution channel for air circulation, and in larger dryers there is a central ventilator with heating unit. In standard dryer models, air circulation is horizontal, but if required due to the nature of the charge, there is the option of using a vertical air circulation system instead, for extra charge.

If a shorter heating time is required or when working with materials with low thermal conductivity, it is possible to set the circulation air settings for increased efficacy. The airflow around the charge is then increased, resulting in the achievement of better heat transfer to the charge.

A flue with automatically-controlled damper may be used. A suction valve provides air supply to the furnace. Should active cooling of the charge be required, pressure cooling may be used with cool air forced into the furnace to cool the charge before being emitted through the exhaust chimney. Cooling regulation is automatic and can be pre-programmed.

The dryer can be custom-designed to include a loading frame or loading trolley to meet the requirements of a given charge. For ease of trolley handling at ground level, grooves can be added in the furnace interior.

SP 3300/02

SV 39600/25

DRYER S 3300/02

Vulcanization of rubber

Technical parameters:

- Inner dimensions (w x h x d): 1100 x 2000 x 1500 mm
- Max. temperature: 200°C
- Input: 37 kW
- Charge: small rubber components
- Charge weight: approx. 150 kg
- Place and year of installation: Czech Republic, 2007

DRYER SV 4000/25

Vulcanization of rubber

Technical parameters:

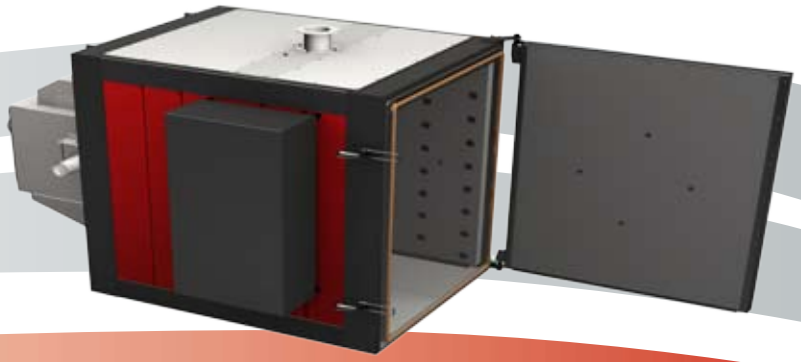
- Inner dimensions (w x h x d): 1200 x 2000 x 1600 mm
- Max. temperature: 250°C
- Input: 31,5 kW
- Charge: Automotive undercarriage rubber components
- Place and year of installation: Czech Republic, 2009

ELECTRIC CHAMBER DRYER SV 2300/25

Vulcanization of rubber

Technical parameters:

- Outer dimensions (w x h x d): 1800 x 2100 x 2850 mm
- Inner dimensions (w x h x d): 1200 x 2000 x 1600 mm
- Max. temperature: 250°C
- Input: 31,5 kW
- Charge: Rubber sealing components
- Place and year of installation: Czech Republic, 2010



DRYER S 4000/01

Stress relief on air conditioning rotors

Technical parameters:

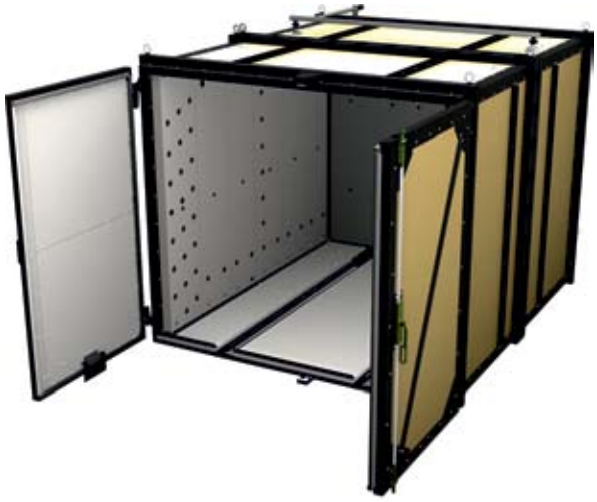
- Outer dimensions (w x h x d): 1800 x 2400 x 2600 mm
- Inner dimensions (w x h x d): 1400 x 1300 x 2300 mm
- Max. temperature: 100°C
- Input: 21 kW
- Charge: plastic rotary parts
- Production capacity: 150 pieces
- Place and year of installation: Ukraine, 2005

CHAMBER DRYER SV 11900/25

Curing composite parts for buses and rail cars

Technical parameters:

- Inner dimensions (w x h x d): 2250 x 2050 x 2700 mm
- Max. temperature: 250°C
- Input: 78 kW
- Charge: composite parts for buses and rail cars
- Max. charge weight: 100 kg
- Place and year of installation: Czech Republic, 2010



DRYER SV 39600/25

Curing composite parts

Technical parameters:

- Inner dimensions (w x h x d): 3000 x 2200 x 6000 mm
- Outer dimensions (w x h x d): 3400 x 3800 x 6300 mm
- Max. temperature: 250°C
- Input: 320 kW
- Max. charge weight: 3500 kg
- Place and year of installation: Czech Republic, 2011

DRYERS SV 7000/25 AND SV 8900/25

Hardening of resins

This dryer is used for hardening disk polisher resin. The unit consists of seven SV 7000/25 atypical dryers with internal circulation and one SV 8900/25 dryer. Heating at 650°C emits toxic and explosive ammonia vapors so the dryers are especially air-tight and every dryer has a pre-installed additional exhaust fan with automatic ventilation flap and chimney exhaust to the hall. Its functionality is monitored by manostat and has also been inspected by TÜV SÜD Czech s.r.o. in Brno, Czech Republic.

The dryers are equipped with a cooling fan and also with an automatic ventilation flap for controlled cooling of the charge. Loading the charge into the furnace is uniform in two columns on the founding frames using a forklift.

Technical parameters:

- Max. temperature: 250°C
- Input: 37,5 kW
- Charge: disk polishers
- Max. charge weight: 2 x 1000 kg
- Place and year of installation: 2011

Bogie-hearth dryers

Bogie-hearth dryers are suitable for drying, curing, surface layer hardening, drying of granulates, burn-in of electronic components and the preheating of materials before further processing. They are also designed for the heat treatment of materials such as artificial ageing of aluminum and its alloys, and other materials, especially in the plastics, rubber, automotive, electronic and foundry industries. The bogie-hearth dryer construction allows ease of loading for bulky and heavy charges using a crane or other means. They are also suitable for operations in which the charge needs to be loaded onto a bogie and then gradually inserted into the furnace.

Description of furnace design:

The furnace is designed around the bogie with a closed furnace chamber through which the bogie moves in and then reverses back out through the dryer upon completion of processing. There are optional add-ons such as suction to remove fumes from dirt, oil and residue from the reaction of the charge itself (eg, epoxides) or active cooling in which cool air is blown in to cool the charge and then exits via a ceiling ventilation flap. The furnace chamber can also be designed with an additional set of doors so that the bogie, or bogies, can drive through, allowing the dryer to function as a single-zoned or even multi-zoned continuous furnace. A multi-zoned solution is particularly advantageous for heat treatment processes which require cooling; the last zone can be devoted solely to cooling, thus eliminating the need to cool the entire furnace, and greatly reducing operating costs.

In the standard furnace model, the furnace door opens manually, to the side. The door is on a C hinge for ease of opening. A hydraulic door opening system with hand lever or foot pedal is available as an accessory for extra charge and opens the door upwards. The maximum opening period is 20 seconds.

The furnace is heated by heating elements which are located in the distribution channel of the central ventilating and heating unit inside the furnace. Air is also sucked out of the furnace through these ventilating units. There are discharge channel inserts on the furnace sides which circulate the heated air back into the furnace work space, ensuring even air circulation and optimal temperature distribution in the furnace. Air circulation is vertical in all standard models. To aid in the management of a complex process of heat treatment, furnaces can also be equipped with a programmable PLC.

The steel bogie is outfitted with flanged wheels for rail travel. Tracks are included with the furnace and can be built into the floor or secured onto it. Rail length is two times the length of the furnace, for maximum safety. The bogie is manually powered with a removable handle, but according to bogie size, may also be supplied with an electric motor and gearbox controlled by a portable control unit with push buttons for forward and reverse, and also an emergency switch.

SVK 14000/03

SVK 50000/03

BOGIE-HEARTH FURNACE SVK 14000/03

Artificial aging and annealing of aluminium profiles

Technical parameters:

- Inner dimensions (w x h x d): 1200 x 1500 x 6500 mm
- Max. temperature: 300°C
- Input: 110 kW
- Control system: PLC
- Charge: aluminum profiles
- Charge weight: 2500 kg
- Place and year of installation: Romania, 2009

BOGIE-HEARTH FURNACE VKNC 20600/05

Artificial aging and annealing of aluminium profiles

Technical parameters:

- Inner dimensions (w x h x d): 1200 x 1500 x 9750 mm
- Max. temperature: 500°C
- Input: 139 kW
- Control system: PLC
- Charge: Aluminum profiles
- Charge weight: 3000 kg
- Place and year of installation: Romania, 2009

BOGIE-HEARTH FURNACE SVK 50000/03

Artificial aging of aluminum profiles after extrusion

Technical parameters:

- Inner dimensions (w x h x d): 2000 x 2000 x 12500 mm
- Max. temperature: 300°C
- Input: 180 kW
- Control system: PLC Siemens
- Charge: Aluminum profiles
- Charge weight: 4500 kg
- Place and year of installation: Romania, 2008

Furnaces with roller conveyors

Furnaces with roller conveyors are notable for the option of placement of a very heavy load onto the conveyor and also for the processing of especially bulky batches. Furnaces with roller conveyors may be chamber or continuous type furnaces. Heating may be done electrically or with gas burners. The conveyor type and the heat process within the furnace can be precisely set according to customer requirements. These furnaces are generally regulated with a PLC which controls the movement of the conveyor, movement of all doors, and partitions between zones, as well as temperature control in each zone (in multi-zone furnaces). These furnaces are most often used for the heat treatment of molds in foundries, in industrial applications for aluminum processing, and also in all applications in which there is a bulky or very heavy charge.

CONTINUOUS DRYER SP 21500/04

Curing aluminum wire coils

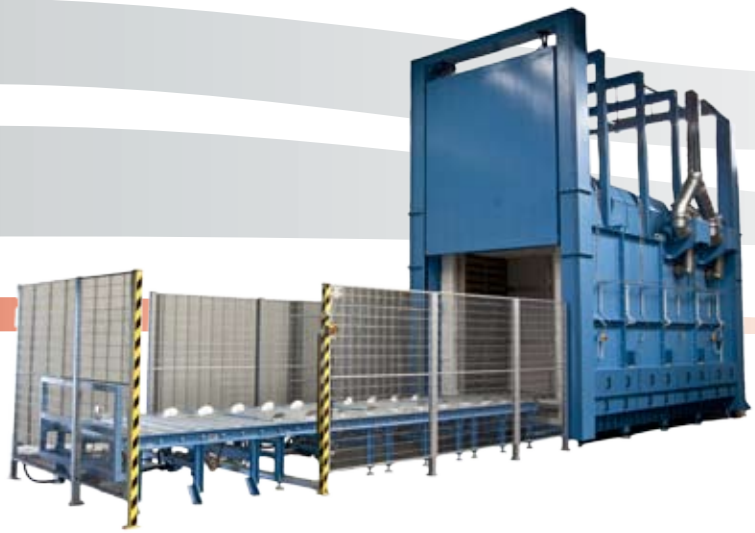
This continuous furnace is for curing aluminum wire coils placed upon steel pallets. Loading on the input conveyor and removing the processed charge from the output conveyor is done with a forklift. The entire furnace conveyor is located behind a protective fence, input and output areas are fitted with light barriers.

Transport of the charge is secured by nine rolling conveyors whose movement is synchronized by a Siemens PLC regulating system. The input door opens upwards and the charge is inserted into the first zone for heating. There is a total of four zones in the furnace. Two are for heating and two are for controlled cooling. Each zone has its own ventilating units with electric heating bodies and also with ventilators for air input and exhaust that can be connected to chimney flue pipes. The ventilators are built into the ceiling of the furnace and there is horizontal atmosphere circulation in the furnace. Each individual zone is separated from the others by insulation barriers to eliminate heat transfer and thus reduce electricity consumption. The barriers, like the doors open upwards and are also controlled by the Siemens PLC. Temperature regulation and control can be done separately for each zone.

The furnace conveyors are constructed for heavy loads (the weight of one pallet with charge is 4 tons, in total up to four pallets can be loaded into the furnace at once). Each conveyor is powered by its own electromotor with transmission. The rollers on each conveyor are equipped with guidance plates so as to avoid collisions with other equipment inside the furnace. Conveyors at the entrance and exit doors are also fitted with a cylinder on the rotary arm which extends and fills the gap on the open door. This system facilitates the sealing of the furnace door, eliminating heat loss and preventing spillage of the charge at the furnace input and output points. When crossing between zones, the conveyors are also guarded by optical sensors that detect the position of the charge in the furnace and prevent any unwanted movement of the conveyor or damage to the furnace and load.

Technical parameters:

- Outer dimensions (w x h x d): 3200 x 6200 x 14600 mm
- Furnace conveyor length: 5500 mm
- Input conveyor length: 2600 mm
- Output conveyor length: 6500 mm
- Clearance profile (w x h): 1600 x 2250 mm
- Max. temperature: 400°C
- Input: 230 kW
- Charge: Aluminum wire coils
- Control system: PLC Siemens
- Place and year of installation: Austria, 2012



CONTINUOUS GAS DRYER SP 12400/02

After-drying of foundry moulds

This continuous furnace is designed for the final drying of the surface sand casting of molds after being coated with water-based paint. The charge chamber contains five semi-molds and is inserted into the furnace on the roller conveyor. The furnace doors open upwards and are located as close as possible to the conveyor track to minimize heat loss, and air circulation in the furnace is set so that the air flowing onto the closed door eliminates heat exchange between the ambient atmosphere and the atmosphere in the furnace.

A double-ceilinged circulation insert of stainless material is built onto hooks hanging from the ceiling. The lower exhaust ceiling is fitted with a series of adjustable blinds which direct the air flow onto the surface of the charge. By changing the size of the air vent (adjusting the blinds) it is possible to regulate the intensity of the air flow separately for each set of 5 molds. Along the sides of the charge, the air flow is sucked back up into the circulation inserts and enters the ventilation units via the upper ceiling. The suction holes along the sides of the inserts are placed in such a way that the most intensive air flow exits at the dryer door and thus achieves a balanced air flow throughout the inner furnace. The main air discharge and suction point is in the ceiling fan circulating pads are placed under the ventilation unit. This unit acts as the central fan unit and is located on the ceiling of the furnace. A gas burner heats the air.

There are removable insulating covers located in the furnace floor. Removing these covers allows the operator free access to the roller conveyor to remove any dirt inside the furnace. The bottom edge of the cover is sealed to the floor with profiled silicon sealant. On the left side of the furnace there are three covered conveyor drive shafts. The drive shafts are sealed around the perimeter with graphite rope. Optical proximity sensors follow the charge through the inner furnace and the entire furnace is connected to the customer's central control system.

Technical parameters:

- Outer dimensions (w x h x d): 2600 x 3100 x 10500 mm
- Clearance profile (w x h): 2000 x 600 mm
- Max. temperature: 200°C
- Gas burner output: 360 kW
- Control system: INDUSTRY controller
- Place and year of installation: Slovenia, 2006

Hot Forming Line

The Hot Forming line is designed for the preheating, pressing and subsequent quenching associated with stamping and is primarily used in the automotive industry. The line consists of an input and output chain conveyor, manipulator robot, two PK9600/10 furnaces, two manipulators for loading the unheated and unloading the heated sheets from the furnaces and pressing them into the cooling circuit.

This new and unique technology replaces the common method in which the sheets are loaded into a continuous furnace and after being heated to the required temperature, come out of the furnace and then undergo the subsequent processes of molding and hardening, a process that is both space and energy-consuming. Considering the high temperature at which the sheets need to be processed (usually 950°C), a continuous furnace solution leads to great heat loss at both the input and output of the furnace during the process, requiring the use of extremely long or tunnel furnace solutions with much higher energy and space requirements to achieve the same output capacity.

The line can be utilized for testing in the development of new processes and for small-series, (about 5000 sets of moldings at 4 pieces/set), but can also be used for full-scale production. Significant time and financial savings can be achieved through use of this technology, compared with the traditional hand-stamping process; of the 160 hours needed for the production of 400 sets of moldings, the new line takes only 12 hours to achieve the same volume, and that includes time spent in preparation and in programming the process parameters. If stamping of individual units is required, the regulating system can also be set for manual operation without use of the robot.

Material flow line:

First the gripper settings, input/output and robot settings are adjusted and set to the desired points for the molding series. Then the process begins. The operator lays the sheet onto the entry bogie and presses the corresponding button. The bogie transports the charge to the robot which then picks up the sheet and moves it onto one of the manipulators at the furnace input point. These steps are done automatically and determine onto which level of which furnace the sheet will be loaded. The heating phase follows, and up to 8 sheet sets may be treated at one time. After the proscribed process time period has ended, the manipulator removes the sheets from the furnace, the robot picks them up and lays them in the press (blanks can also be pressed) and hardening is done. After that the sheets are again picked up by the robot and put onto the output conveyor which transports them outside the furnace where they can be loaded onto pallets by the operator.

Technical description:

The furnaces are designed with four levels, each with a door with automatic (pressurized air) ventilating flaps. This design ensures that only the flap for the given level that needs it opens, and also that the flap is only open for the amount of time that is absolutely necessary for the loading or removal of the charge, thus significantly lowering energy use. The inner furnace is outfitted with non-ferrous material, (with the exception of the heat-resistant storage combs for the sheets) in order to most effectively eliminate thermal expansion. This allows the robot to utilize precise batch grasping points at pre-defined locations. In order to increase energy savings and reduce waste, the inner furnace space has been minimized. This furnace may also be produced in a semi-gastight version for use with protective atmosphere.

The manipulators at the front of the furnace have two axes of movement. In the horizontal direction, the loading arm is located on a precise ball track and is powered by two geared servomotors. Operation speed, incline and decline ramps and arm length can all be regulated by the operator to meet the needs of the process. The fastest speed of movement between the two farthest points is 2 seconds. In the vertical axis, movement is powered by two servomotors driven by a scissor mechanism on a ball screw. Stroke speed and length are easily readjustable, the travel time between levels is less than 10 seconds.

The robot is produced by a specialized manufacturer, and its axis follows a moveable track, allowing movement between the various parts of the line (conveyors, furnaces, press). It has a bilateral tentacle, one side with mechanical grips which are used when loading sheets into the furnace and the press, the other side with pneumatic grips which are used to move pressed sheets onto the output conveyor.

Gripper

CHAMBER FURNACE PK 9600/10

Preheating and hardening mouldings

Technical parameters:

- Outer dimensions (w x h x d): 4300 x 2600 x 3100 mm
- Max. temperature: 1000°C
- Input: 230 kW
- Charge weight: 30kg/level
- Control system: PLC Siemens
- Charge: metal shapes
- Place and year of installation: Czech Republic, 2011

Chamber and bogie-hearth furnaces

The most common usage of those furnaces is for large or heavy charges. The furnaces are designed for temperatures up to 1280°C (electric) and up to 1400°C (gas).

The furnaces are of an industrial design suitable for heavy-duty operations. The furnace construction design may be either a chamber or a bogie-hearth one. The decision for one of them usually depends on the type of charge handling. The furnace doors are standardly hung on a "C" hinge. If required we are able to supply a door with hydraulical opening (lever, button or foot pedal regulation). The furnace bogie, if it is included, can be driven on rails. It may be driven manually or by electric engine.

When using electric heating the heating elements are hung on the furnace walls or possibly on the doors and on the back of the furnace to provide even distribution of heat. Often even in the floor (covered with SiC plates resistant to high loadings). For lower temperatures (up to 850°C) it is necessary to equip the furnace with air circulation (provided by a ventilator inside the furnace chamber).

The furnaces are standardly equipped with a valve for easier ventilation of the inner furnace space. In case the charge needs to be cooled down we are able to equip the furnace with overpressure cooling or possibly with an exhaust for exhausting the residues or fumes. If the heated charge is contaminated with residues of oil, wax, etc., fume is being formed and produced and it can contain unburnt solid elements. The exhaust of the furnace may then be equipped with a burning chamber in which the complete burning of these elements will be accomplished thanks to high temperatures (over 1000°C – 1400°C).

In case it is not sufficient enough to heat the process by electrical heating convectors we use gas heating. Gas furnaces may be supplied in a chamber or in a bogie-hearth design. Because of the dimensions the bogie-hearth is the more common solution of the two. For heating the charge a direct heating may be used when the burner is burning directly in the furnace chamber or an indirect heating when the burner is designed as so called radiant tube and the combustion products do not get in direct contact with the charge.

In case of direct heating a few technical solutions may be selected. For lower temperatures (up to circ. 600–700°C) it is necessary for the furnace to be equipped with a circulation ventilator. The burner burns in so-called burning chamber in which the burnt gases are mixed with cold air to reach the desired temperature. The circulation ventilator then distributes this mixture of the burnt gases with air into the inner furnace space and provides the homogeneous temperature field.

For higher temperatures (up to 1400°C) we can use the solution with a number of burners built directly into the working space of the furnace. The number and distribution or placement of the burners are selected based on the nature of charge and other characteristics. For those purposes we can use monoblock or fast-burning burners. If required we are also able to install in the furnace recuperative burners that decrease chimney losses of the whole device and radically decrease the total consumption of the furnace.

A gas furnace is always equipped with a chimney for exhausting the residues or fumes. After the completion of heating the charge, for some versions of burners this chimney may be used for cooling the furnace with the charge.

VKTP 13000/11

VKTP 20000/11

VKTP 20000/11

Annealing of undercarriage components for railway carriages and other rail vehicles

Technical parameters:

- Outer dimensions (w x h x d): 3900 x 2900 x 6600 mm
- Inner dimensions (w x h x d): 2900 x 2600 x 4000 mm
- Max. temperature: 1100°C
- Power of burner assembly: 1200 kW
- Max. charge weight: 21 tons
- Control system: PLC Siemens
- Charge: Railway carriages
- Place and year of installation: Belarus, 2011

VKTP 20000/11

VKTP 13000/11

Heat resistance testing of safes

Technical parameters:

- Outer dimensions (w x h x d): 3700 x 3800 x 3300 mm
- Inner dimensions (w x h x d): 2300 x 2750 x 2500 mm
- Max. temperature: 1100°C
- Burner power: 120 kW
- Fuel: Light fuel oil
- Control system: INDUSTRY controller
- Charge: Security safes
- Place and year of installation: Bulgaria, 2010

VKTP 13000/11

LINE 2xKNC/H 1000/65

Heat treatment of aluminum castings; solution annealing and artificial ageing

Furnaces designed for the heat treatment of aluminum by curing. They are two double-chamber furnaces with a rolling track in the furnace and with a water bath in front of the furnace. The charge is placed in baskets into the manipulation frame which moves vertically in front of the furnace. On the manipulation frame there are two rolling tracks. The starting position of the frame is in the lower position. The basket with the charge is placed on the frame by a high-lift truck and it is pulled into the furnace automatically by pneumatic roll. When the heat processing is finished the charge is again pushed out of the furnace by the pneumatic roll on the manipulation frame which is in the upper position and immediately it lowers the charge into the water bath. The manipulation with the charge from opening the door until lowering it into the bath takes 12 – 15 s. which is a very important parameter to provide the required characteristics of the material after the heat processing.

All mobile parts of the furnace essential for handling the charge are driven by pneumatic rolls (including doors), the whole process is completely automated and controlled by a software unit. The operator only initiates the start of individual pre-set steps of the heat processing.

Other types of heat processing may be of course performed in the furnaces.

Technical parameters:

- Outer dimensions (w x h x d): 4400 x 5250 x 5600 mm
- Inner dimensions (w x h x d): 800 x 750 x 800 mm
- Max. temperature: 650°C
- Input: 37 kW
- Control system: PLC Hitachi
- Charge: Aluminum castings
- Place and year of installation: Czech Republic, 2003

CONTINUOUS LINE KNC/H 5760/65

Annealing of shell moulds for precise casting

This chamber furnace with roller conveyor can be used at temperatures of up to 650°C. It is suitable for the heat treatment of shell molds using a melted aluminum casting method. Shells freed of wax are deposited into one of the basket's sand beds. Once full, the baskets are inserted into the furnace with the automatic manipulator. The furnace is divided into two zones separated by a curtain. Any remaining wax on the charge is burned off shortly after entering the first zone, so this zone is also outfitted with an exhaust flap. After heating, the shells will harden. After the zone has been emptied of the last batch, the charge basket moves along the roller conveyor into the next zone where the partially open door allows the basket to be ferried onto the counter where the shells can be removed from the basket. To prevent cooling of the shells, the basket can also be reinserted into the furnace. After removal of the remaining shells from the basket, the basket is ferried back on the reverse conveyor to the loading point so that a new batch can be loaded.

Compared to a traditional conveyor furnace, this solution has the advantage of smaller dimensions for optimal space utilization, as opposed to the use of two such furnaces to achieve the same production capacity. There is no need to maintain two casting workplaces and insertion of the charge into the sand takes place outside the workplace. When loading the charge, there is no increased heat loss caused by a missing bogie in the furnace.

Technical parameters:

- Outer dimensions (w x h x d): 2600 x 3650 x 5700 mm
- Length of furnace conveyor: 4800 mm
- Clearance profile (w x h): 1300 x 1100 mm
- Max. temperature: 650°C
- Input: 135 W
- Charge: shells for aluminum casting
- Place and year of installation: Czech Republic, 2005

LINE KNC/V 1000/65

Thermal processing of aluminum castings

Another possibility how to arrange the line for aluminum curing is the use of a portal furnace with a hanging charge. The working space includes two furnaces and a bath. The furnaces are placed on rails and they move from the working position, that also serves for charging, into the position above the bath. The operator places the charge under the furnace by pallet truck where he or she hangs it and initiates the program. Both furnaces are connected to one operation system with a programmable software unit, the whole process of heat processing is completely automated, there is no need for the operator to interfere. Handling the charge is performed by electric power winch, the furnace doors are driven hydraulically. After completing the processing the furnace moves over the water bath, the door opens and the charge is lowered into water. Thanks to minimizing the distance between the furnace and the water bath the time between lowering the charge into water and leaving the furnace may be as short as 8 – 10 s.

Technical parameters:

- Outer dimensions (w x h x d): 7700 x 3550 x 3350 mm
- Inner dimensions (w x h x d): 1000 x 1400 x 1000 mm
- Max. temperature: 650°C
- Input: 39 KW
- Control system: PLC Siemens
- Charge: Aluminum castings
- Place and year of installation: Czech Republic, 2011

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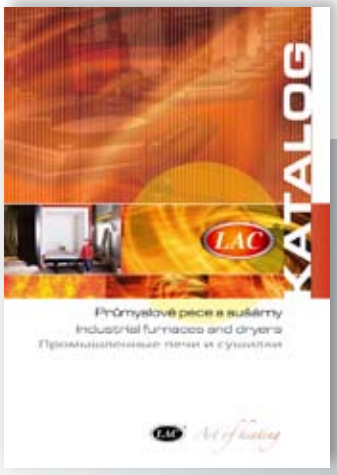

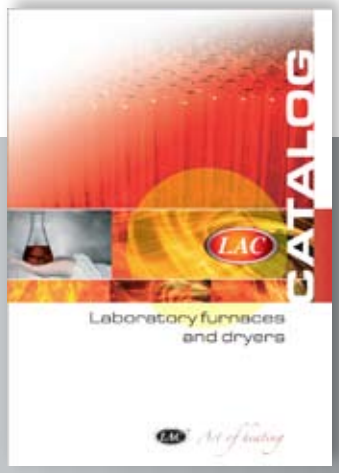

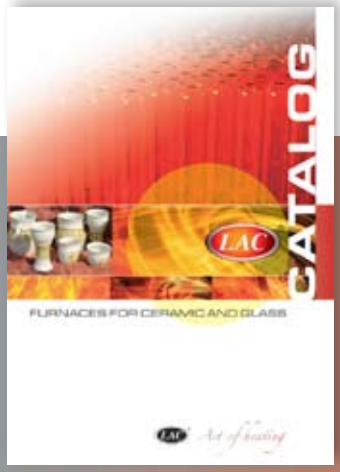

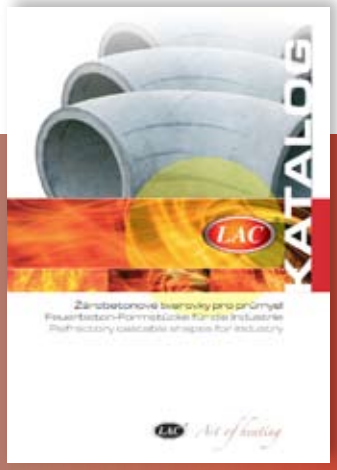

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