FURNACES FOR CHEMICAL HEAT TREATMENT
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LAC Ltd. with its registered office in Rajhrad near Brno has been for 15 years successfully dealing in manufacture of furnaces and dryers for numerous technological applications such as:

- mechanical engineering
- foundries
- electro technical industry
- plastic and rubber industry
- custom-made hardening shops
- research
- laboratories
- stomatology
- jewel-making
- ceramic industry
- education
- glass industry
- art ceramic
- china production

Production range of LAC Ltd. for domestic and foreign markets does not consist of a complex line or serial-made furnaces and dryers only, but it meets also requirements in the area of non-typical design of furnaces according to the customer’s specific requirements.

Dynamic development of the company is illustrated by the current number 250 employees, registered capital of 12 million CZK, 25 000 m² of production, storage and administrative premises and 8,000 furnaces manufactured to date.

In our sales department we are ready to meet your requirements and provide qualified advice on selection of the most suitable furnace for any application. Our own team of service engineers providing maintenance of our products is a matter of course.

Besides main products we offer also supply of heating elements, refractory and insulation materials, control elements, refractory shaped pieces and implementation of reconstructions of furnaces, heating systems and switchboards.
Offered Modules:
- Carburizing and hardening furnace
- Hardening bath
- Washer
- Process media distributor
- Manual manipulator
- Batch site

Line Extension:
- Tempering furnace
- Salt separator
- Nitriding furnace
The line is suitable for heat and chemical-heat treatment of metal parts. It is suitable for treatment of those parts, in which quality of surface is very important. The charge is during treatment and transporting from furnace to hardening bath under protective atmosphere all the time. This atmosphere not allows ingress around atmosphere to charge and inhibiting creation of clinker in surface of parts so. All process is automatic, so that requires minimal interventions from staff. The line can be used for the following types of chemical thermal treatment: ➤ Carburizing ➤ Annealing ➤ Hardening ➤ Nitrocarburizing
Advantages:

- Reduction of operation costs by flexible adaptation of the line to your immediate needs
- Easy adaptation of grate system to various sizes of the batch
- Reduction of production, handling and operating cost
- Automatic transfer of batch among individual modules of the line
- Allowing for alternate use of various hardening environments
- Hardening in batch up to 450 °C
- Modular design
- Simple and easy batch handling
- It can be combined with other types of equipment according to technological needs

**DIMENSION RANGE TABLE**

<table>
<thead>
<tr>
<th>Type LAC</th>
<th>60</th>
<th>120</th>
<th>220</th>
<th>350</th>
<th>600</th>
<th>950</th>
<th>1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charge height [mm]</td>
<td>300</td>
<td>650</td>
<td>650</td>
<td>700</td>
<td>700</td>
<td>900</td>
<td>1100</td>
</tr>
<tr>
<td>Charge diameter [mm]</td>
<td>300</td>
<td>300</td>
<td>430</td>
<td>500</td>
<td>700</td>
<td>900</td>
<td>1100</td>
</tr>
<tr>
<td>Charge weight [kg]</td>
<td>60</td>
<td>120</td>
<td>220</td>
<td>350</td>
<td>600</td>
<td>950</td>
<td>1200</td>
</tr>
</tbody>
</table>
Application:
The furnace serves for the following types of chemical heat treatment of metal working:

- Hardening
- Annealing
- Carburizing
- Nitrocarburizing

Maximal temperature 950 °C
Electric heating
Three zones temperature regulation
Oxygen sound Process Electronic
Controlled cooling
Charge locked inside the furnace
Excellent insulating properties
Application:
This furnace is used for tempering below controlled atmosphere.

For maximal temperature: 450/650/850 °C
Protective atmosphere inlet
Retort
Heating controlled by heating meanders
Circulation of internal atmosphere (till 650 °C)
or meanders (850 °C)
Furnace bottom modified for grate setting
Ventilation chimney
Program end sound signaling
INDUSTRY controller
Forced cooling
Excellent insulating properties
**Application:**
This furnace is suitable for surface nitrogen saturation in the gas atmosphere with assistance of gas ammonia. Nitrogen release devices on surface which diffuse to steel and create nitrides in the surface layer with alloying elements. Temperatures for nitriding move between 500 a 540°C. The nitride surfaces length is from 0,1 till 0,5 mm. To obtain high surface hardness, increase abrasion resistance and improve corrosion resistance are main advantages of the nitriding.

**Standard design:**
- For maximal temperature 650°C
- Refractory steel gastight retort
- Circulation insert in the retort for internal atmosphere polarization
- Ventilator located in the furnace lid for internal atmosphere circulation
- Hydraulic opened lid / manually uncovered sideward
- Silicone sealing on the furnace flange added
- Regulation thermocouple inside the retort
- Three zone heat regulation
- Cooling ventilator
- Process media distributor (ammonia, nitrogen, air)
- Process gas inputs in the furnace lid
- Isoblocks isolation
- Heating ensured by heating meanders
- Nitriding atmosphere controlled by nitriding sound
- Temperature and gas atmosphere regulation

**Accessories for extra charge:**
- Graphic or digital recorder
- RS 232 or RS 485 interface for connection of controller to PC
- Spare retort, spare retort
- Charge thermocouple
Application:
Hardening into:
- Oil
- Salt
- Water
- Polymer

Hardening medium heating
Hardening medium mixing (it is possible change fluently the speed of the blender)
Hardening reservoir air cooling (salt bath – among jacket, oil bath – heat exchanger)
Salt bath with inlets for emergency heating
**WASHERS**

**Application:**
Batch washing (degreasing) and drying before treatment and after hardening.

**Standard design:**
- Double chamber rinse system
- Working medium temperature 60 °C
- Oil separator or connection on salt regenerator
- Turning drive with charge
- Automatic recharging and reservoir level monitoring

- Washing chamber
- Liquid level Sensor
- Oil separator

**HARDENING SALT REGENERATOR**

**Application:**
This regenerator is suitable for salt regeneration from rinsing water from washer for batch washing after salt hardening.

**Standard design:**
- Continual and also discontinual working process
- Automatic rising of allowing water from washer reservoir
- Cycle end alarm
- After regeneration is possible to return salt in to hardening bath
- Heated bleed valve for salt melting

- Regenerator cooling
- Heated cock
- Switchboard
Application:
This distributor serves for delivery of process media into the chemical thermal treatment of metals. The distributor consists of box with a system of piping, valves and flow meters in the upper part. In the lower part, there are methanol vessels.

Process media:
- Methanol
- Propane
- Air
- Ammonia
- Nitrogen

Connection of all media to central distribution
**MANIPULATOR**

**Description:**
Manipulator (with skids featuring special adjustments) manipulates the batch across the line length, operating all equipment of the line.

**Manual manipulator:**
- Electric lifting
- Manual traveling

**Automatický manipulátor:**
- Fully automatic movement and lifting

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**BATCH SITE**

**Description:**
The batch site includes table for one or two charges. There are thorns for grate scheme setting on the table desk.
**Description:**
We supply modern and reliable control system from company Process Electronic to the chemical heat treatment line.

**PROTHERM 500** –
Universal programming machine for heat treatment processes.

**Machine function:**
- visualisation of connected devices with possibility of multi-colour image of relevant components such as fans, magnetic valves, etc
- control of connected process parameters – temperature, characteristic values of atmosphere (e.g. CP, log PO2), furnace pressure, etc
- programs relating to relevant batch, monitoring of individual batches across the device
- documenting of process parameters including alarms
- control of target values (e.g. Carburizing depths) using the on-line diffusion calculation
- archiving of all process changes

**Intuitive control:**
- one-hand controlling of cursor and value data using a rotation pushbutton
- function pushbuttons to activate functions directly
- possibility of connection to bar code scanner

**Visualisation:**
- animated image of the device
- setting-up selected data in an overview
- complete processing of alarms with control, e.g. control of alarm check and horn
- check indicator
- archiving of failures

**Additional functions:**
- furnace module for calculation of atmosphere values from gas inlet and data scanned by sensors
- on-line calculation of carbon and nitrogen diffusion into steel
- hardness calculation from material analysis

**The device is a web–server.**

**Hardware equipment:**
- industrial computer with a 6-inch TFT screen, 7 pushbuttons and rotating controller, serial interface, keyboard connection, IP 54 protection from the face, 24V supply voltage
- integrated Internet, network card for connection to configuration software or control computer system via TCP/IP
- integrated CAN-Bus interface card for connection of necessary analogue and digital peripherals

**PROTHERM 600** –
universal programming machine for heat treatment processes.

**Hardware equipment:**
- industrial computer with a 12.1-inch colour TFT screen, 7 pushbuttons and rotating controller, serial interface, keyboard connection, IP 54 protection from the face, 24V supply voltage;

**Or, the following alternative systems can be offered:**
- PROTHERM 400
- PROTHERM 50
- PROTHERM 9800
Application:
These furnaces are suitable for heat treatment of materials in controlled atmosphere (argon, nitrogen, forming gas etc.) with low gas drain, till the maximal temperature 1100 °C. Especially for bright annealing, tempering, soldering, steel powder sintering etc.

Standard Design:
- PKR for max. temperature 1100 °C
- Gastight retort
- INDUSTRY controller
- Limit unit
- Space for thermocouple location inside the retort
- Low protective gas consumption
- Heating elements on sides and on the bottom
- Optimal temperature distribution in internal chamber space
- Insulation by insulation fibre bricks and mineral fibre
- Manually opened door and water cooled seal grid
- Doors are sealed by silicon sealing
- Manually operated inlet of protective atmosphere for one gas
- Pressurized cooling with automatic flap on input and output of air cooling

Accessories For Extra Charge:
- Graphic recorder temperature
- RS 232 or RS 485 interface for connect the controller to PC
- Atypical stand
- Charge thermocouple
- Air-pump
- Manovacuometer
- Spare retort
- Automatic protection atmosphere supply for one or more gases (supplied always with air pump)
- Forced internal atmosphere circulation – furnace PKR for 900 °C
## WITH GASTIGHT RETORT PKR

<table>
<thead>
<tr>
<th>Type LAC</th>
<th>t max</th>
<th>Vol.</th>
<th>Internal retort dimension (w×h×d)</th>
<th>External dimension (w×h×d)</th>
<th>Input</th>
<th>Weight</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKR 35/11</td>
<td>1100</td>
<td>24</td>
<td>220×260×450</td>
<td>1400×1450×1300</td>
<td>11</td>
<td>400</td>
<td>400</td>
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<tr>
<td>PKR 55/11</td>
<td>1100</td>
<td>30</td>
<td>320×200×450</td>
<td>1450×1450×1300</td>
<td>13</td>
<td>570</td>
<td>400</td>
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<tr>
<td>PKR 130/11</td>
<td>1100</td>
<td>75</td>
<td>450×200×700</td>
<td>1450×1450×1550</td>
<td>21</td>
<td>950</td>
<td>400</td>
</tr>
<tr>
<td>PKR 180/11</td>
<td>1100</td>
<td>110</td>
<td>500×340×700</td>
<td>1650×1650×1550</td>
<td>29</td>
<td>1050</td>
<td>400</td>
</tr>
<tr>
<td>PKR 350/11</td>
<td>1100</td>
<td>230</td>
<td>700×340×1050</td>
<td>1800×1750×1850</td>
<td>50</td>
<td>1350</td>
<td>400</td>
</tr>
</tbody>
</table>

*Detail of airscrew for internal air circulation of furnace PKRC*
We offer full service in field of chemical heat treatment included supply of replacement part (retort, hardening bath cover etc.) and old machinery reconstruction (furnace lining etc.)

- **Lining reconstruction of Aichelin furnace**
- **Retort for chemical-heat treatment furnaces**

### Heating Elements

- **Heating patrons for furnaces Aichelin**
  - Classification temperature 1200 °C
  - Metal protective tube

- **Heating patrons for furnaces Ipsen**
  - Ceramic protective tube

- **Heating body Ipsen**
- **Special heating elements**
The line consists of these modules:

- 2× carburizing furnace
- 2× hardening oil bath
- 2× automatic washer
- Manual forklift
- Tempering furnace PP 220/85

This line is regulated by system from company Process Electronic.