<table>
<thead>
<tr>
<th>PRESS MATRIX</th>
<th>HPF-/MEGA-SERIES</th>
<th>BETA-SERIES</th>
<th>ALPHA-/OMEGA-SERIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. DEPTH OF FILL [mm]</td>
<td>500 – 800 (1.200)</td>
<td>300</td>
<td>45 – 120</td>
</tr>
<tr>
<td>MAX. USEABLE DIE SURFACE W X D [mm]</td>
<td>700 x 400 – 1.050 x 1.200 (1.200 x 1.800)</td>
<td>1.400 x 1.100</td>
<td>1.120 x 500 – 1.600 x 1.000</td>
</tr>
<tr>
<td>PRESS POWER [kN]</td>
<td>6.300 – 36.000</td>
<td>30.000</td>
<td>6.000 – 42.000</td>
</tr>
<tr>
<td>MAX. EJECTION POWER [kN]</td>
<td>1.250 – 4.500 (6.000)</td>
<td>1.200</td>
<td>140 – 300</td>
</tr>
<tr>
<td>FUNCTIONAL CAPACITY IN STROKES/MIN.</td>
<td>(1,0) 2,5 – 7,0</td>
<td>4 – 10</td>
<td>18 – 32</td>
</tr>
</tbody>
</table>

**HYDRAULIC PRESSES**

**CONTENT**

4 – 5  CONCEPT OF LAEIS PRESSES
6 – 7  PRESS / FILLING SYSTEM / SHAPING / VACUUM PRESSING SYSTEM
8 – 9  HYDRAULIC SYSTEM
10 – 11  ELECTRONIC CONTROL
12 – 13  UNLOADING SYSTEM / ACCESSORIES
14 – 15  REFRACTORY PRODUCTS
16 – 17  ADVANCED CERAMICS
18 – 19  DRY PRESSED ROOFING TILES
20 – 21  SPECIAL APPLICATIONS
22 – 23  SERVICE
Worldwide the name LAEIS stands for especially efficient, highly developed and trend-setting pressing technology. Being the leading manufacturer of presses for refractory and ceramic products as well as for the building materials industry we are continuously involved in the development of our well proven technology for applications in other areas. The most modern control technique and highly reliable hydraulic components ensure low operating cost and reduced energy consumption. Our newly developed vacuum pressing technology provides for shorter cycle times and significantly improved product quality.
LAEIS offers the right solution for different industries and applications, be it for products of large size or complex geometries. Special selection criteria are the depth of fill and the required specific pressure. Owing to the wide range of auxiliary equipment and system expansion components available, not only traditional materials for the ceramic, refractories and building materials industry but also materials such as metal oxide, graphite, salt and waste products, generated for example in steel works or power plants, can be compacted.

The trend-setting technology of LAEIS presses is the result of long standing experience. Consequently, the LAEIS HPF double-pressure principle with active mould defines the technological state-of-the-art for the production of quality products in the refractory industry. In the ceramic industry, the OMEGA press series with its one piece frame concept and a reduced energy requirement of 25% demonstrates impressively how experience and know-how are transformed into innovative technology at LAEIS.
MAIN COMPONENTS:

1. PRESS
2. FILLING SYSTEM
3. SHAPING
4. VACUUM PRESSING SYSTEM
5. HYDRAULICS
6. PRESS UNLOADING SYSTEM
7. ELECTRONICS
8. PERIPHERAL EQUIPMENT

Bottom:
OMEGA 2100 for products with low thickness

Left: HPF IV 2000 for refractory products
Bottom: HPF III 650 R for nozzles and sleeves
PRESS (MECHANICAL PART)
All LAEIS presses with exception of the HPF 630 and the OMEGA series are in column construction. The characteristic HPF double-pressure principle requires only one pressing cylinder, which is installed in the upper cross head of the press and thus outside the main area of contamination. The hydraulic block is arranged directly at the pressing cylinder, providing for: Short distances for the oil, favorable current circuit and low vibration.

Pressure build up in accordance with:
- Double pressure system with active mould for thicker products
- Single-sided pressure system with or without floating mould for products with low depth of fill

Rigidity, FE-based design in three basic design variants:
1. Column construction with pressing cylinder and lower traverse of nodular cast iron and pre-tensioned column ends
2. Welded frame construction with guide columns and inserted pressing cylinder
3. Cast frame of nodular cast iron with screwed-on pressing cylinder

Press plunger in chilled casting with modern, friction free servo seal systems

PRESSING PRINCIPLES:

<table>
<thead>
<tr>
<th>DOUBLE PRESSURE</th>
<th>SINGLE-SIDED PRESSURE</th>
<th>NON-ACTIVE DOUBLE PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPF, SIGMA</td>
<td>ALPHA, OMEGA</td>
<td>ALPHA, OMEGA</td>
</tr>
</tbody>
</table>

Right: Influence of the pressing principles on the density distribution inside the pressed product

FILLING SYSTEM (VOLUMETRIC OR GRAVIMETRIC)
The quality of the pressing starts with the filling of the mould. Experience shows that materials tend to segregate on their transport to the press. To reduce such segregation, LAEIS has developed special mould filling concepts. The parameters for the different shapes and qualities have to be determined only once and are then stored together with the pressing parameters.

Volumetric and gravimetric filling systems
Charger box mixer meters and homogenizes the pre-fill and ensures a uniform filling also for multi-cavity moulds
Charger boxes with universal honey-comb filling inserts or specially designed filling inserts
Double-layer filling systems
Hydraulic drive with precise positioning and speed control
Fast exchangeable box mixer
SHAPING (MOULD DESIGN)
Based on the most modern technology, LAEIS develops high-quality products providing for a long service life. Through optional hydrostatic compaction an even application of the specific pressure is ensured: Guarantee for a homogeneous density distribution and perfect edges, even with intricate product geometries. Press moulds are custom-made and are available with different grades of coating or hardening. The extremely simple handling of the mould package provides for a minimum time requirement for the mould exchange. For each type of press LAEIS provides for an individual efficient mould changing and clamping system.

In-house mould design
Experience also with complicated products (pipes, nozzles, plates / slabs with spigot, groove and/or lock seams)
Additional hydraulic axes integrated into the mould for optimum density distribution
Fast mould changing times

VACUUM PRESSING TECHNOLOGY
For all products it is essential to obtain a high density while at the same time avoiding lamination, that is to avoid enclosure of air in the pressed product. Thanks to a newly developed vacuum pressing system the air inside the material is evacuated with the shortest possible time (ca. 2-4 sec.) before the pressing starts. Owing to this evacuation, additional de-airing cycles and slow pressing speeds can be reduced.

New economic vacuum pressing system with small volume of evacuation
Higher final density of the product and avoidance of lamination
Improved productivity thanks to reduced cycling time
Significantly reduced investment and maintenance cost
The concept of the hydraulic system is of decisive importance for the performance of a hydraulic press. The hydraulic design of LAEIS presses is consequently designed to provide for low energy and utilities consumption. Drive capacity and performance load are optimally matched for each product. Modern and reliable hydraulic components of well-known manufacturers ensure low operating cost and guarantee that variations in quality can be considered something of the past. Through modern proportional valves in connection with a closed loop control system the structure can be essentially simplified and the number of components can be reduced. The result is an improved reliability and a simplified and guided fault diagnosis via a screen. High reproducibility and independence from external influences such as temperature and friction lead to an outstanding product quality. The encapsulated pressurized hydraulic system with a separate filtering and cooling circuit provides for a consistently good oil quality.

**HIGHLIGHTS OF THE LAEIS HYDRAULIC SYSTEM:**

- Scalable hydraulic units in accordance with the same design pattern
- Regulated axial piston pumps for an effective energy utilization
- Proportional valves for an optimum regulation of all cylinders
- Separate filtering and cooling circuit for a continuously good oil quality and cleanliness
- Valve blocks arranged close to the energy consumers resulting in short reaction times
- Auxiliary cylinders move the press plunger quickly and precisely thus reducing dead times
- Encapsulated and pressurized hydraulic system for utmost oil cleanliness and improved service life
Top: Main valve block of an HPF press

Center: Hydraulic unit in compact design

Left: Main valve block of an ALPHA press
»Totally Integrated Automation« achieved with our hydraulic presses signifies the uniform storage of data, communication and projecting/programming of all press series. The control system distinguishes itself through intuitive operator guidance in connection with a simple and fast fault identification. All LAEIS presses are equipped with Siemens S7 controls and robust Siemens panel PCs, which allow for complex data management.

With the standard Fast-Ethernet interfaces LAEIS presses can be connected to a network without additional expenditure. Connections with Profibus-DP to the decentrally arranged periphery along with tele and fault diagnosis, tele visualization and data exchange (Internet/Intranet) ensure safe and fast communication.

The graphic operator panel ProVi guides the operator in a product-oriented method through the input of parameters. Via the recipe administration parameters once determined can be stored and called for at any time. Thus, a constantly good product quality is guaranteed. ProVi is product-oriented. All dimensions are relative dimensions and can be taken, for example, from a drawing of the product and entered into the control.

HIGHLIGHTS OF THE LAEIS ELECTRONIC CONTROL SYSTEM

- Intuitive product-oriented data entry
- Graphic interface under MS-Windows with the possibility to connect directly to a company network as a standard feature
- Processing and storing of production data and setting parameters
- Decentral multi-processor control make Siemens with Profibus-DP
- Electronically controlled press axes for highest precision and reproducibility, independent of environmental influences
- Recording of each pressing as standard feature
- Comprehensive service and maintenance features
CONTROLLER DESIGN FOR CLOSED LOOP CONTROL:

1. NOMINAL VALUE
2. MOTION CONTROLLER
3. PROPORTIONAL VALVE
4. CYLINDER
5. PRESSURE TRANSDUCER
6. MEASURING ROD/ACTUAL VALUE

Top and left:
Graphic operator guidance in the menu structure
PRESS UNLOADING SYSTEM

LAEIS presses are equipped with gripper systems the design of which correspond to the geometry of the products to be manufactured. Available are: Membrane grippers, rotating pickers, vacuum pickers, tong-type picker with and without turning device.

Our gripper systems guarantee a secure gripping and depositing onto a subsequently arranged transport conveyor. Damage or breakage are reliably avoided.

ACCESSORIES

For individual application LAEIS offers a comprehensive range of accessories for complementing or optimizing your plant.

PRESS ACCESSORIES:

- Filling table height adjustment
- Process data recording PRODATA
- Tele diagnosis
- Hydraulic mould clamping and changing system HYDROFAST
- Oil spraying aggregates
- Material feeding system (also heated)
- Moulds
- Mould changing car
- Gravimetric filling system
- Vacuum pressing system
- Robotic system for loading and unloading
- Additional charger systems, facilitating a production change to multi-layer products with special effects
- Compact and mobile oil filtering and pumping unit
Bottom: Vacuum handling system for large-sized plates

Top: Membrane picker for double-cavity moulds

Left: Pushing device for salt licks

Top: Vacuum picker for flat products

Left: Automatic die cleaning system

Top: Tong-type gripper with turning device
LAEIS HPF presses convince with their reliability, flexibility and high degree of automation. This is why they are widely used for the production of quality refractory products of greatly varying size, shape and raw material:

- Standard and tapered shapes
- Nozzles, slide gates, crucibles, stoppers and pipes
- Cassettes, dish saggars and other kiln furniture shapes
- Checkers and honeycomb bricks
- Insulation bricks

**UNIFORM DENSITY AND UTMOST PRECISION**

The so-called double-pressure pressing system with movable upper die, movable mould and fixed lower die is characteristic for the HPF press series. The mould moving speed and all other movements can be exactly adjusted to suit any raw material to be compacted. Thus, upper and lower die enter the mould under independent control and the compacting process can be optimally adjusted to suit the shape and the material of the product to be manufactured.

During pressing friction is created at the mould wall which by means of the »active mould wall« principle assists in the compaction of the product.

The mould is moved independent on the movement of the upper die (master-slave principle). This dependence can be varied during the pressing operation so that variable compaction processes with the aim to control the position of the neutral zone can be realized. The master-slave principle also applies for creating a curve-type mould filling program of the charger box, i.e. the mould filling position is regulated in dependence of the charger box position during its retraction movement.

This provides for a uniform, reproducible mould filling, independent of friction and oil temperature.

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**HIGHLIGHTS OF HPF PRESSES**

- Presses in accordance with the double-pressure principle
- Optimally designed components thanks to FE calculation
- High product quality and dimensional accuracy due to automatic brick thickness measuring and regulating system
- Always exactly controlled movements due to closed loop control in accordance with the master-slave principle
- Entry of absolute values for pressing, ejection and charger box speed
- High efficiency and short reaction time due to the compact design and the arrangement of the valve control close to the energy consumers

Left: Master-slave control for influence on density distribution inside the product

Right: Additional axes and lifting unit for products having a complex geometry
Top: HPF IV 2500

From left to right:
- HPF III 1600
- HPF IV 2000
- HPF III 650 R with active lower die for nozzles and sleeves
For the production of advanced ceramics, all process steps have to be controlled carefully. Specifically adapted feeding and mould filling systems guarantee highest precision and repeatability of the individual filling weight and allow for a controlled material distribution in the mould to ensure a uniform densification, even with complex geometries or large-sized products. The forming process itself is controlled by most modern technologies, depending on the application also supported by an effective vacuum pressing technology and separately controlled active mould elements.

Thus, high green densities and uniform density distributions over the entire volume of the product are achieved, which are comparable to those formerly only obtained by isostatic pressing. The dimensional precision (length, thickness and height tolerances as well as edge quality) surpasses by far other forming technologies (near net shape).

These new qualities in hydraulic pressing technology are used for instance in the fabrication of large sized sputtering targets (ITO) for PVD plants with dimensions of up to 1100 mm x 420 mm and a thickness of only 8-10 mm. Further examples are components for fuel cells, big carbon blocks, electro-ceramics like PTC substrates having extreme aspect ratios (e.g. a fired thickness of 0.5 mm at dimensions of 300 x 300 mm), ceramic armor in large dimensions with complex shapes and many others.

A special highlight: Presses designed for ceramic products are optionally available with a filling depth of up to 120 mm.

The development of the single-piece frame of the OMEGA press series was based on experimental values from machines used in the steel processing industry. The reduction of the moving mass by about 16% leads – together with other measures – to an energy saving of 25%.
Top left:
**OMEGA 3000** for ceramic tile and large-sized special ceramics

From left to right:
**ALPHA 1500-06-120** and **OMEGA 2100**
With an average moisture of up to about 7%, dry pressing technology will be most favorable.

With medium moistures of about 7 - 12% the investment costs will be comparable for both conventional and dry technology.

For clays with higher moistures the drying energy balance is in favor of the conventional side. Waste energy from the kiln can be used.

For the dry process, only one or two silos sufficient for buffering of the dry powder over several hours (maybe one day) are necessary.

The dry preparation process allows the elimination of clay impurities like pyrites or calzite during dry milling.

The dry preparation route needs less individual machines and can be built more compact and requires less space in the building.

The granulating equipment provides a homogeneous feed for the pressing process. It ensures a good flowability of the granules for even filling of the mould with a constant moisture. At the same time, also other components like sand or barium carbonate, even in small quantities, can be added and mixed very homogeneously.

Switching from one product to another simply means changing of the mould, which can be done in a very short time.

The same pressing material is used for the different shapes, no change in recipe or moisture is necessary.

Remarkably less machines in the shaping department, again saving valuable (and costly) space.

Pressing takes place in closed steel moulds, no excess material is squeezed out during pressing and must be recycled.

No gypsum mould department is necessary.

Pressing of a clay body with only about 11% moisture under comparable high pressure and vacuum application during pressing lead to a product with a very high green strength.

Immediate handling e.g. by robots equipped with vacuum grippers without supporting structure is possible, no deformation takes place.

No preceeding drying step necessary.

Direct coating of the green tiles is possible.

Due to less shrinkage during the drying period there is less drying breakage.

For drying no extra support frames are necessary. Firing in upright position without cassettes is also possible.

Elimination of clay impurities (pyrites, calzite) in the dry milling process avoids occurrence of efflorescence and allows the use of raw materials with minor quality without any loss in product performance.

Pressing with high pressure under vacuum lead to products with higher density / less porosity than conventional roofing tiles.

Better freeze/thaw resistance can be achieved.

Higher strength of the tiles with the same thickness or lower thickness for the same strength is possible.

The „dry pressed“ roofing tiles also show an improved surface quality (smoothness, optical appearance) and dimensional accuracy.
ALPHA 1500
roofing tile and
large-sized
special ceramics
Presses of type HPF are also used for many different applications outside the refractories industry. For this our technical and technological know-how has been constantly improved and developed.

**SALT PRODUCTS**
In a production plant for salt licks designed by LAEIS a multitude of salt qualities and shapes can be produced. A special surface protection and a concerted selection of materials for the machine parts guarantee troublefree processing of the highly corrosive salt. With LAEIS plants you can produce up to 30 t per shift – with highly accurate mix compositions which are guaranteed to be free from contamination. Furthermore, LAEIS provides plants for the production of salt blocks or tablets for water softening.

**SAND LIME BRICKS**
The compact manufacturing cell SIGMA K 650 KS with integrated gantry robot PR 200L is a synonym for quality improvement, increased capacity and reduction of investment and operating cost for the production of sand lime bricks and fly ash bricks. The PR 200L takes the pressed bricks directly from inside the press and deposits them straight onto the curing car without any intermediate handling. Further advantages are the quick installation, integration and commissioning of the press at site as well as the fast mould exchange.

**ANODES FOR ALUMINIUM PRODUCTION**
The LAEIS plant concept for the production of prebaked anodes is an economical alternative to vibration forming. Our plant concept ensures an exact adjustment of the optimum material characteristics in the paste preparation (supplied by our partner companies), a high accuracy of the metering system and an optimum and uniform compaction in the press MEGA 1600 AV. With a so far unequaled throughput of up to 50 t/h or even more anodes of all actually required sizes can be produced with excellent dimensional accuracy and with high density. Additionally, the LAEIS concept offers better service availability and lower upkeep expenditure as well as reduced environmental impact (less noise and less emission of hazardous substances).

**SPECIAL BUILDING MATERIALS**
Presses and plants are also available for the production of special building materials. Large floor elements based on fiber reinforced concrete are produced on an ALPHA press. Other examples are wall elements with tailored climate conditioning function and surface design or building construction materials made of by-products or waste products from other industries. In close cooperation with customers LAEIS develops optimal formulations including appropriate binder systems and process technologies.
Top and bottom:
Details of a SIGMA 650 KS for the production of sandlime brick

Left: Anode production plant

Left and bottom:
HPF III 630 Salt
The success of LAEIS as a reliable and innovative supplier of equipment of the highest industrial standards is based on two strong points, namely the continuous development and transformation of our comprehensive know-how in other fields of application as well as on our excellent service system on which our customers can rely. Worldwide.

CONSULTING SERVICE
Individual technical advice is one of the key elements at LAEIS. Which is why our employees work around the clock – highly motivated and constantly looking for optimum solutions.

SPARE PARTS
Short-term provision of quotations and extremely short delivery times guarantee an optimum in machine uptime for our customers. We have 11,000 spare parts available – factory inspected original parts and high quality replacement parts.

PREVENTIVE SERVICE AND MAINTENANCE
Expert maintenance improves machine availability and a continuously high product quality. An economic service contract with LAEIS guarantees a regular inspection and maintenance of your LAEIS machines. In the framework of preventive maintenance possible problems are detected at an early stage and necessary preventive action can be taken.

TROUBLESHOOTING
Equipped with the most modern diagnostic and repair tools our technicians offer a remedy for any disturbance in the fastest possible time.

TRAINING
Competent employees are the foundation of each company. Therefore, LAEIS offers tailor-made training programs in order to enable the operators to utilize the installations in the most economic and efficient way.
11,000 spare parts available at any time

Service around the clock