Machines for solid metal forming

Die Forging Hammers

LASCO UMFORMTECHNIK
WERKZEUGMASCHINENFABRIK
**HO series**

![Schematic of HO-U hammer.](image)

All data are proposals and can be adjusted to customer’s requirements.

<table>
<thead>
<tr>
<th>HO series</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
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<td>Blow energy [kJ]</td>
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<tr>
<td>Blow frequency [1/min]</td>
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<td>Max. ram stroke [mm]</td>
<td>570</td>
<td>580</td>
<td>640</td>
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<td>Ram depth [mm]</td>
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<tr>
<td>Daylight between guides [mm]</td>
<td>440</td>
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<td>580</td>
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<td>Overall weight [t]</td>
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<table>
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<td>Max. ram stroke [mm]</td>
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<td>730</td>
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<td>Min. die height without dovetails (upper and lower die) [mm]</td>
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<td>220</td>
<td>280</td>
<td>300</td>
<td>500</td>
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<tr>
<td>Daylight between guides [mm]</td>
<td>700</td>
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<td>850</td>
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<td>Frame base width [mm]</td>
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<td>Overall weight [t]</td>
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<td>164</td>
<td>213*</td>
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<td>4900</td>
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<td>5800</td>
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<tr>
<td>Main motor capacity [kW]</td>
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<td>2 x 55</td>
<td>2 x 75</td>
<td>2 x 90</td>
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*with base plate

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All data are proposals and can be adjusted to customer’s requirements.
Technologically and economically, the forging hammer is still the best forming machine available to the forging industry. It provides a maximum of forming force coupled with lowest possible investment of time, cost and energy.

The forming characteristics of forging hammers are ideal for a wide range of commercially available forgings.

Many forgings, especially complicated, heavy ones, can only be produced economically with a hammer.

The use of modern, direct spring damping has eliminated the effect of vibrations generated by the hammer on the surrounding ground.

The sound power level can be considerably reduced by partially encapsulating the hammer.

LASCO is the pioneer and inventor of hydraulic power drive systems for die forging hammers.

LASCO’s over 60 years of engineering experience and continual development of hydraulic hammers has maintained its position as a leading international manufacturer of forging machines.

LASCO not only invented the first hydraulic die forging hammer. It also delivered the largest and most of the hydraulically driven hammers in the world.
The question as to whether an anvil or counter-blow hammer is the best machine for a particular application is decided by the range of parts to be forged and, more importantly, by their size.

Up to a working capacity of approximately 200 kJ an anvil hammer is preferred. To cover this range, LASCO offers the HO-U/HO series. For heavier blanks requiring higher working capacities, the model GH counter-blow hammer is preferred.

For almost any older hammer – regardless of manufacture – LASCO offers an energy-saving method of modernization involving conversion to the best-suited hydraulic drive system. Electronic control in combination with a hydraulic ejector in the anvil insert in the lower ram die has made LASCO die forging hammers suitable for fully automatic operation.
The freely programmable control of the LASCO HO-U hydraulic double-acting hammer provides a multiple of forging solutions and is a further step toward achieving higher production figures with consistent high quality.

Hydraulic top pressure accelerates the ram fastest possible to the requested impact velocity of approximately 5 m/s. This means that the blow frequency is substantially higher than with a gravity drop hammer.

The LASCO HO concept ensures:

- high forging accuracy
- high blow frequencies
- precise energy control
- simple, safe operation
- suitability for automation
- direct spring damping
- optimum die life

LASCO HO-U 250, 25 kJ blow energy, programmable control.
There are many reasons for choosing a LASCO die forging hammer. Here are just a few:

- Lower energy costs in comparison with pneumatic or steam driven machines coupled with precise adjustment of working capacity and blow frequency ensure maximum efficiency.

- Elimination of a compressor or steam network provides flexibility. The hammer is always ready for operation.

- Short reversal of stroke and short contact times considerably reduce die stress. Optimum die life is achieved by using control engineering.

- The guiding system maintains almost constant clearance in spite of ram’s heat expansion.

- Excellent sealing of the piston rod is achieved with standardized seals and one-piece guide bushings.

- A fast-acting automatic safety flap prevents escape of oil.

- Varying die heights are entered by the operator and automatically corrected by the control.

- The heating system fitted directly in the oil reservoir ensures the hammer is always ready for use. This is standard on all LASCO die-forging hammers.

LASCO’s world market experience in hydraulic power drives was gained from the sale and delivery of around 1200 successfully operating hydraulically powered hammers and hydraulic power drives with capacities of 6.3 to 400 kJ. This experience forms the basis for the modern design and construction of these high-performance machines.
**Frame**
Hammers with capacities up to 200 kJ are designed with a so-called U-frame. Above this capacity, the counter-blow hammer design is preferred because of anvil weight and related transport problems.

In the nineteen fifties, LASCO was one of the first hammer manufacturers to design and produce the U-frame.

The relatively short ram stroke of the double-acting drive enabled the mass of the LASCO U-frame to be distributed ideally, ensuring high rigidity and solid design. All cross-sectional variations meet the results of photo elastic analyses.

The frame is made of alloyed cast steel that has been given a precise, controlled heat treatment.

Frame weight and base area have been designed to be mounted on spring damping elements. Frame weight and ram weight are optimally coordinated.

**Insert block**
A high-strength, generously sized insert block of hardened and tempered steel is keyed into the U-frame.
Piston rod
The piston rod is the most stressed component of a die forging hammer. Resulting from scientific investigations and evaluation of practical experience, both the piston rod and its anchorage in the ram have been constantly optimized. The rod is flexible and designed for minimum possible mass. The selection of a high-grade material that has passed through several finishing processes and a demanding surface treatment ensures long life.

Guiding system
The guide rails of tempered steel are arranged such the influence of temperature fluctuations between ram and frame are minimized.

Ram and ram guiding
The solid block ram is made of forged, hardened and tempered steel. The guidings are X-configured and the favorable width to height ratio of the ram ensures ideal guiding characteristics. Automatic oil pressure lubrication provides optimal gliding conditions and minimum wear.
Drive
The encapsulated drive system is installed in a cast head adapted to the demanding working environments in the forge. The head also serves as an oil reservoir and is mounted with vibration damping onto the uprights. The use of a forged control block combining most of the important control elements reduces the need for pipework almost completely. This type of control system ensures high operational reliability and efficiency.

The “heart” of the hydraulic drive consists of durable axial piston pumps driven through flexible couplings by special three-phase motors. The hydraulic fluid is constantly purified by monitored filtration. Constant, optimal fluid temperature is guaranteed by automatic temperature control, which, in turn ensures consistent performance unaffected by ambient temperature and operational conditions and prolonged life of the hydraulic fluid. LASCO’s hydraulic drives have proved their operational reliability over a thousand times. In times of rapidly rising energy costs, this is one more reason to choose a LASCO product.
Operator and operational safety are given high priority at LASCO. This is why LASCO equips its machines with safety systems that go beyond safety regulations.

**Safety module** prevents an uncontrolled delivery of blows. It can also be retrofitted on older LASCO hammers.

**Piston rod safety cover** with automatic safety flap.

**Ram safety prop** can be swiveled into the working space and is electronically controlled.
The experience gained in the manufacture and operation of hydraulic anvil hammers formed the basis for development of hydraulic counter-blow hammers.

With regard to handling, efficiency and safety, these metal-forming machines meet the high demands of the forging industry just as competently as anvil hammers.

The LASCO GH concept ensures:

- high forging accuracy
- high blow frequencies
- suitability for automation
- precise energy control
- optimum die life
- simple, safe operation
- direct spring damping

LASCO GH 2500, 250 kJ blow energy, weight: approx. 150 000 kg, programmable control.
The rams of the counter-blow hammer have unequal masses. The mass ratio of the upper to the lower ram is 1:4 to 1:5, depending on size. On smaller counter-blow hammers, the upper ram is guided into the lower ram. On larger counter-blow hammers, the lower ram is guided into a solid cross beam of cast steel that absorbs all lateral forces.

Crossbeam and uprights for the lower ram are connected to each other with form-fitting joints. Combined spring damping elements may be fitted under the base.
The working principle
The resulting ram impact velocity is around 6 m/s. The ram strokes are constant. Varying die heights, for example after die change, are automatically compensated. Because of the chosen mass ratio, the lower ram moves at a final velocity of only 1.2 to 1.5 m/s.

Similar forging conditions exist as for anvil hammers. The chances of the blank jumping out or shifting is significantly less than with conventional counter-blow hammers with rams of similar mass. The installation of ejector systems within the hammer’s working space is also facilitated because of the short stroke of the lower ram and, therefore, also an automation of the hammer.

During the reverse stroke, the air cushions located under the lower ram dampen the impact when the ram reaches its end position, reducing the forces absorbed by the foundation and allowing the dissipating energy to be captured directly. This is a further advantage in comparison with counter-blow hammers of conventional design.

Drive
The drive system is encapsulated and installed in block construction on the head crossbeam. In its design and construction it is, largely, the same as the drive for the anvil hammer. The lower ram is pressed down against two air cushions into its starting position by two plungers. The rams are not connected, neither mechanically nor with a hydraulic coupling. Their motions are precisely controlled by the hydraulic drive system.

Frame
The frame is a multiple element cast steel and welded construction. It consists of a solid base plate, the uprights and the crosshead. Pneumatic springs for the lower ram drive are installed in the base plate. The uprights are anchored centrally to the base plate, incorporating the guides for the lower ram. The crosshead is fixed on the uprights, carrying the control block for the complete hydraulic drive system. In addition, extra guides for the upper ram and the ram-locking device are built into the crossbeam.

Safety systems for the piston rod, ram and ram guidance
These systems are also largely similar to the LASCO HO-U machines.
Enhanced control

Decentralized process control
The “brain” of every modern machine tool is its decentralized process control. As LASCO is totally customer focused, all configuration and programming is performed in-house.

LASCO’s core competence in software programming and in the design and installation of electronic and electric components allows the consideration of all customer requests that are technically feasible, including the provision of interfaces for integration of existing processes and interlinked operations.

LASCO process and machine controls offer all the performance characteristics of a modern production organization, such as:

- centralized, product-related setting and evaluation of all machine parameters
- product data administration, optionally with data base link
- operating data registration
- product follow-up
- integration in MRP
- integrated maintenance programme
- integrated data logger

The requests of the customer are also considered, when designing man-to-machine interfaces, as well as specific screen menus and charts (available in several languages).

The operator is guided by a graphic colour display, which is in the same language as the messages displayed at the terminal. The registration, evaluation and listing of data can be input simultaneously during operation and the data can be transferred to the network via interfaces.

Software modules specific to the customer can be linked. Options of integrated phone- or internet-aided online maintenance systems are offered.

Efficient interfaces ensure the real time communication with automation systems and industrial robots. In principle, a data logger is integrated and offers the possibility of archiving internal and external analogous and binary signals.

LASCO control concepts are decentralized on the basis of bus systems. Only hardware of international industrial standards is selected. This permits customers the possibility of making adjustments and performing maintenance work on their own as well as reprogramming and enhancing at a reasonable price. Not least this means a high security of investment.
The variety of forged components and materials forces the need for special equipment. In order to provide flexible adaptation to various forged product ranges, LASCO can offer comprehensive options.

**Position and speed measurement**
With the help of sensors, the controller is able to register the position of the rams. This allows the energy to be controlled such that the required thickness of the blank is achieved with highest accuracy. At the same time, the energy used for each blow is measured.

**Noise reduction**
Encapsulation reduces the sound power level.

**Spring damping system**
Vibrations emitted by the hammer can be absorbed almost completely. Forging hammers have become environmentally friendly.

**Online maintenance**
This system allows access to the control process for service technicians in the LASCO headquarters. LASCO experts can call up control functions and carry out analyses, remote diagnosis and online optimization.

**Hydraulic ejector**
These ejectors enable smaller die angles and closed die forging.

**Multi-piece frame**
Multi-piece frames are used for working capacities exceeding 200 kJ. If required, smaller hammers can also be designed with.
With the help of modern hydraulics, control and sensing technology, coupled with a whole range of patented features, LASCO has drastically enhanced the range of applications for die forging hammers. LASCO hydraulic die forging hammers fulfill all the demands placed on metal-forming machines regarding process capability and efficiency. As the first manufacturer of machine tools worldwide, LASCO has realized fully automation on die forging hammers.

Components
A sensor patented by LASCO designed for the demanding environment which is found in the forging industry measures ram position and velocity. The system detects, for example, if the die is closed, whether the part is fully forged or whether a further blow is required. The detected ram speed is compared with the preselected value. This allows compensation to be made for any external influences that may have an effect on the system.

The essential key component of automatic hammer forging is the patented forge gripper that holds the part accurately in the required position during all operations.

The robot works on the principle of a human operator: taking up the billet with the gripper – positioning in the impression – deliberate yielding during the blow (without releasing) – lifting – transferring to the next impression.

Special, adapted and commercially available industry robots are used for handling. The synchronous master-slave operation of two robots provides a number of benefits: The billet is initially gripped at both ends and then synchronously cycled through the individual forging operations in the impressions. This allows to forge safely and remove longer blanks in multiple die cavities configured in a row.

Complex requirements
The forge grippers have to fulfill complex requirements:

- safe positioning in the impressions
- safe absorption of acceleration forces and relief of robot axes
- compensation for changes in the length of the billet
- deliberate release when the billet adheres to the upper die
- general suitability for the demanding working environments which exist in the forging industry

Programming
The overall system is programmed via a special user surface on the central process control. The programmer enters the essential parameters and only a few points are taught die installation. The actual programming of the robot is taken over by the master control.
Benefits
The possibilities for installation of a forging line are just as diverse as the parts to be manufactured. The main advantages of automatic hammer forging are:

- process stability
- exclusion of positioning errors
- savings in personnel costs
- increase in output
- increase quality of the forged parts
- reduction in scrap rate
- enhancement of multiple impression forging

The patented gripper from LASCO is the key to automation of die forging hammers.

Longer blanks can be forged in multiple impressions using LASCO grippers.

A fully automatic forging line for the manufacture of hand tools.
All the benefits of the hydraulic drives from LASCO can be applied to other types of hammer drives. The HO drive was specially designed for the conversion of hammers with short stroke, light ram and limited space in the working space of the hammer. LASCO offers a specially adapted hydraulic drive for the conversion of long-stroke hammers. This overall concept guarantees high efficiency and accuracy.

Hundreds of completed conversions and modernizations in the performance range 6.3 to 125 kJ are evidence of LASCO’s competence.

The conversion of all types of hammers with modern LASCO drives offers several advantages, including:

- energy savings
- high blow speed
- precise energy control
- modern control technology

An old belt lift hammer with 30 kJ of blow energy converted to hydraulic drive.

A pneumatic double-acting hammer with 40 kJ blow energy, before and after conversion to a LASCO hydraulic drive.
### Technical data

**GH series**

- **A**: Max. ram stroke
- **B**: Ram depth
- **C**: Max. die height without dovetails
- **D**: Min. die height without dovetails
- **E**: Daylight between guides
- **F**: Height above floor

#### GH series 630 800 1000 1250 1600 2000 2500

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<thead>
<tr>
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<td>1200</td>
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<td>Max. die height without dovetails [mm]</td>
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<td>500</td>
<td>550</td>
<td>620</td>
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<td>Daylight between guides [mm]</td>
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<td>770</td>
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<td>Frame base depth [mm]</td>
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<tr>
<td>Overall weight [t]</td>
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- **Note**: at a height of floor to upper edge of the insert of 700mm

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#### GH series 3200 4000

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<td>320</td>
<td>400</td>
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<tr>
<td>Max. stroke of lower ram [mm]</td>
<td>145</td>
<td>150</td>
</tr>
<tr>
<td>Max. stroke of upper ram [mm]</td>
<td>555</td>
<td>575</td>
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<tr>
<td>Ram depth [mm]</td>
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<td>Max. die height without dovetails [mm]</td>
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<tr>
<td>Overall weight [t]</td>
<td>240</td>
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<td>Height above floor [mm]</td>
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<td>Main motor capacity [kW]</td>
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