

ADVANTAGES OF FORGING



Forging evolution.

WHAT IS FORGING?

FORGING IS A MANUFACTURING PROCESS WHERE METAL IS MODELED BY APPLYING PRESSURE AFTER MAKING IT DUCTILE THROUGH THE APPLICATION OF HEAT.

(The Forging Industry Association)

Forging techniques are useful for working metal because they enable the desired shape to be given to the steel and also improve its structure, especially because they refine its grain size.

Forging takes ingot as a raw material, which is subjected to hot deformation in order to refine the metallurgical structure.

No other steel deformation process can equal the capacity of forging to develop an optimal combination of properties.

Forging is normally used in components where safety is fundamental, for instance, in planes, cars, tractors, boats, oil drilling equipment, motors and other industrial machinery.

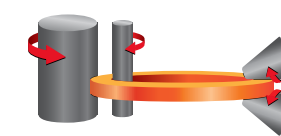
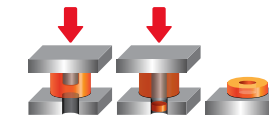
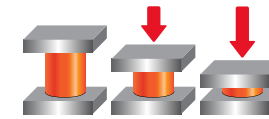


TYPES OF FORGING PROCESSES

SEAMLESS ROLLED RINGS

This process directs grain flow in tangential and radial directions, and provides the pieces with the mechanical properties such as strength, ductility, and resistance to impact and fatigue.

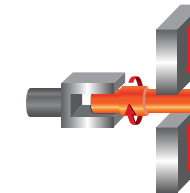
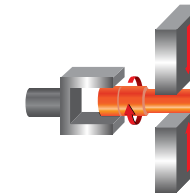
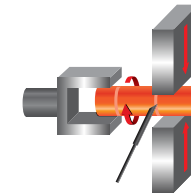
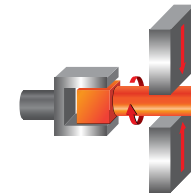
1. Ingot is cut according to the necessary weight and the press preforms the cut achieving the structural and directional integrity of the grain.
2. The disc is perforated creating a "doughnut."
3. The "doughnut" enters the roller, where the mandrel exerts pressure against the radial until the desired diameters are obtained.



OPEN DIE FORGING

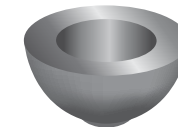
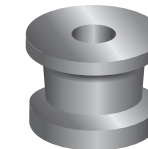
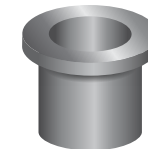
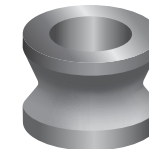
This is the process of free deformation of the material through the use of flat dies. The ingot is manipulated between the dies, which press the piece until it achieves the desired geometry.

1. Prior molding to achieve the desired diameter.
2. The work areas are marked on the piece.
3. The markings are forged to the desired size.
4. The piece is flattened and rounded for a better surface finish.



POT DIE FORGING

Pieces forged with a special tool to print a semi-final shape. These offer a competitive advantage, since they save in material and machining time by maintaining the properties of the forged material.



FORGING IN COMPARISON WITH OTHER METALLURGICAL PROCESSES

COMPARED WITH:

ADVANTAGES OF FORGED BARS AND RINGS



Casting

- Directional flow that enables the improvement of impact and mechanical resistance properties
- Better metallic yield
- Saving in machining hours
- Less quality-related re-work
- Wide range of products and sizes
- Better response to thermal treatment
- Chemical segregations are eliminated
- Facilitates inspection in Non-destructive Tests
- Minimum porosity in pieces



Plating

- Custom manufactured pieces
- Directional flow that enables the improvement of impact and mechanical resistance properties
- Better metallic yield with improvements in material cost
- Does not require elaborate cutting processes
- Improved metallurgical microstructure
- Improvement of internal quality, less sheetings in the pieces



Welded products

- Greater reliability of mechanical properties by eliminating the welded joint
- Reduction in reprocessing and rejections
- More reliable and better quality pieces
- Easy to inspect
- Easy manufacturing process

HEAT TREATMENTS

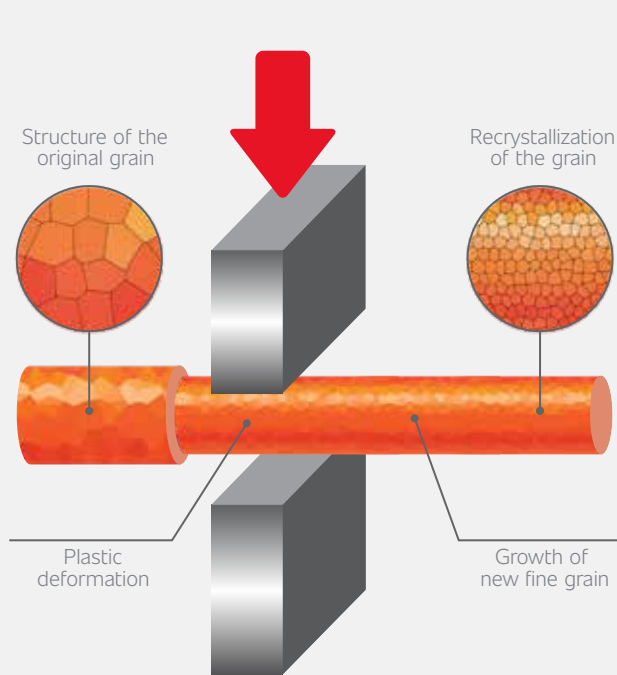
At Frisa we are able to meet the highest requirements in mechanical properties and hardness for any type of piece. We offer any type of heat treatment required:

- Normalizing
- Quenching
- Tempering
- Annealing
- Solution Annealing
- Spherodizing
- Aging
- Stress Relieving
- Any other treatment in accordance with customers' technical needs

THE FRISA ADVANTAGE

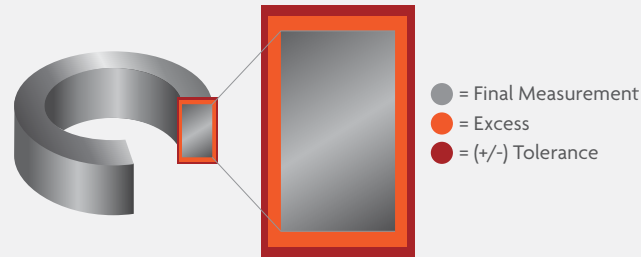
Stronger components

Forging provides better mechanical properties, ductility and fatigue and impact resistance because this process refines and directs the grain flow according to the shape of the piece.



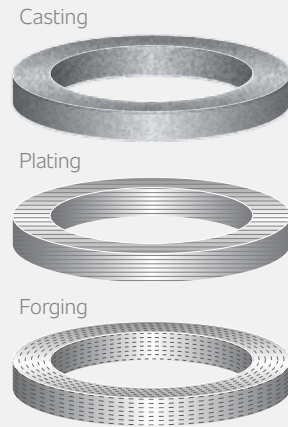
The open die forging process modifies the structure of the crystals.

In most cases, the ingots have been pre-worked and this produces a “grain flow” with important directional properties: greater mechanical resistance, greater ductility and fatigue and impact resistance.



Through a minimal use of material excesses, it is possible to guarantee an optimization in costs while providing a piece with the appropriate tolerances that always guarantee that the piece can clean at final measurements.

The forging pieces have a directional grain flow, therefore, their mechanical and metallurgical properties are better than any other process. The structural integrity of a forged piece cannot be beaten by any other transformation process, since it removes porosities, gases and internal cavities that could cause unexpected faults under stress, fatigue and impact.



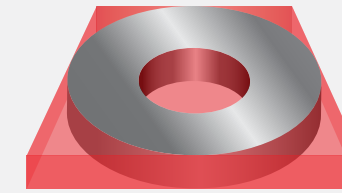
Range of Steels

Almost all metals—ferrous and non-ferrous—can be forged. Any kind of steel can be used: carbon, alloy, stainless or superalloy.

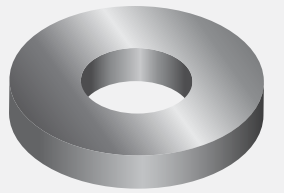


Significant Savings

Forging reduces the weight required to manufacture the piece, therefore, there is a real and significant cost savings. Also, the pieces have less excess so they require less machining hours and less material to be used to clean the piece at the end.



Plating machined ring



Forged ring

Wide range of shapes and sizes

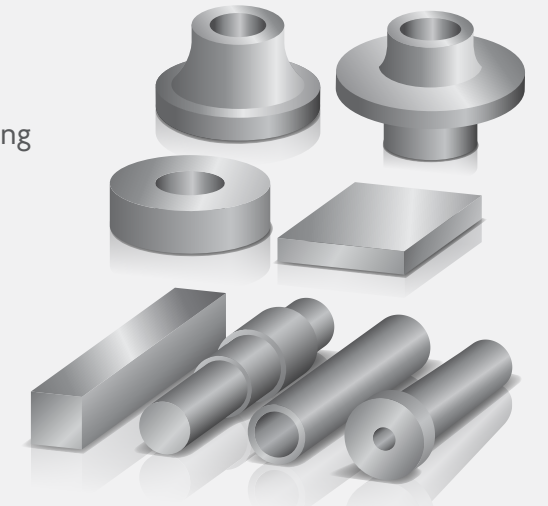
The design of shapes is so versatile that they can be forged from simple bars and rings to more complex pieces, according to different needs.*

Rolled Rings

315 in maximum outside diameter
67 in maximum length
40 in maximum wall
55,000 lb maximum weight

Open Die Forging

70 in maximum outside diameter
287 in maximum length
55,000 lb maximum weight



*information can vary depending on material and geometry



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With information from experts
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