All about the hand made, traditional production of an exceptional timepiece

Inside the Art of a Swiss Clock Manufacturer

L’Epée relives the fascination of a swashbuckling historical romance, by the magic of a double animation of duel with swords.

This new animation, which is a Power-Reserve Indicator, is to be used as the L’Epée brand signature.

As the first complication was not enough, the Double Retrograde Second depicts two crossed swords keeping step with time for 20 seconds before returning instantly to the “en garde” position. This clock therefore offers to observers a fascinating visual fencing display.

The purpose of this article is to demonstrate the art and passion the L’Epée brand place in the production of its products family named “LE DUEL”.

Respecting closely the long-time tradition, each part of a L’Epée clock is made by hand, by experienced clockmakers. Only top class materials are used, especially polished brass which gives the clock its shine and weight. The beauty of L’Epée clocks is enhanced by highly polished cases and dials, lacquer adornments and glass sides. Each clock is protected by a varnish, contributing to its great look with a gold or rhodium coating.

L’Epée Clocks are equipped with beautiful mechanical movements which can be viewed through the glass sides and tops. All parts of the movement are polished and coated with the exception of the steel parts.

A L’Epée Clock contains up to 600 parts in solid brass or steel, requiring over 4000 manufacturing process. No wonder, the clockmakers are highly qualified craftsmen producing outstanding masterpieces of traditional Swiss clockmaking art.

L’Epée is more than ever active on top-quality mechanical movements stemming from a close alliance between its own hand-crafted production methods and the most advanced manufacturing techniques.
The first step in the development of a L’Epee timepiece is the design. The design is made in house or in collaboration with well-known designers.
L’Epee Le Duel - Design

Each L’Epée Clock fits within the history and the value of the brand

The quality of the design is really important as it is essential for success. The design needs to bear all the DNA expressing the value of the brand.

The design process is crucial in the life of a product as it will directly lead to its success.

Each L’Epée product is designed with in mind specific codes. They express the identity of the brand and they respond to customer needs by matching their aspirations and values. Once the codes have been listed and explained to the designer, the design work begins. It always starts by hand-made sketches. A set of drawings is made for each important aspect of the clock. For example, the general form of the case, the hands, the dial...

The final sketches are selected to pursue the design. Even if it looks simple, this selection step can take up to 12 iterations before the final choice is made. When all those sketches are selected, the final design-work can start. First by hand, then on a special computer program and then in 3D.

All the details are reviewed. The shapes, the types of material, the finishing of each part, the coating. And the reflection is made on each part to find out if a polished finish is chosen on some components... or the way light is acting within the moving parts...

All those steps can take more than a year before the design fulfills all the high expectations of the Manufacture L’Epée.
All the L’Epee products are engineered with the most advanced 3D construction softwares.
The 3D modeling allows the engineering team to have a precise look into all the details of the construction. It allows simulation on all the penetration of the tooth throughout all the gear chain, calculating the Hertzian pressure, all the friction coefficients, the power reserve... It allows also to simulate all the manufacturing limits. Even if the usual tolerance standard of manufacturing is the micron at the horology scale, all small details have to be taken into account to reach the level of perfection needed for a complicated product to ensure that the final product will be as nice as required.

3D engineering is the key to design a highly complicated product. It allows the team to have a better comprehensive view of the moving parts, of the penetration of the wheels, of the constraints and solutions in the manufacturing.

L’Epée uses also an in-house design tool to simulate the shape of the teeth of each wheel and to calculate the pressure they will handle.

The power reserve can be calculated with this specially designed tool. And the barrel spring as well as the escapement can be adapted to reach the goal fixed by the marketing team.

All the L’Epée clocks and all the complications are developed using the 3D modeling to insure that all the parts can be manufactured and to allow long lasting life to the timepiece.
From Sketches to real parts

A Long journey within the manufacture
L’Epee timepieces are made out of solid pieces of metal such as brass.
The quality of the raw material (metal purity and density) used in production of clock is highly important as it directly affects the clock finish as well as its durability over the years. An impure material will react over time and an unsatisfactory and smooth density of metal will incorporate air micro-bubbles that will end as tiny holes on surfaces and this is not acceptable by the Manufacture L’Epée.

Nowadays, a clock is no longer only a timepiece. Its primary function is not anymore to give time but to be an extension of the owner. A clock is typically an ornament piece that states in his living room the refined taste of its owner.

The clock expresses the personality of its owner.

So its quality and its look are very important. For a better aspect of the clock, the sheet of metal needs to be laminated. The cutting process needs attention and preparation to avoid scratches and other defects.

The precise cut of large metal pieces needs a heavy duty machine.

Worker in the Manufacture choosing the best metal bar and preparing it for cutting slices according to the dimensions needed for etching by the CNC machine.
Underneath picture: One of the stock shelves dedicated to bars of raw material.
L’Epee products require the best and most modern way of manufacturing parts.
L’Epée Le Duel - Manufacturing

L’Epée is using the best tools to shape all the details of the clock

Unlike for watches, the parts in a L’Epée clock are large but they have to be as precise as the watch ones.

There are different sorts of machine operations to realize such parts:

- Drilling is used to create a round hole and is accomplished by a rotating tool that has typically two or four cutting edges.
- In turning, a cutting tool with a single cutting edge is used to remove material from a rotating workpiece to generate a cylindrical shape.
- In boring, the tool is used to enlarge an already available hole. It is a fine finishing operation used in the final stages of the production process.
- In milling, a rotating tool with multiple cutting edges is moved slowly relative to the material to generate a plane or straight surface. The speed motion is provided by the rotating milling cutter. The two basic forms of milling are Peripheral milling and Face milling.

Once the modeling is done on the 3D CAD software, the model can then be incorporated in the 3D CAD machine to optimize the milling of each part. All the parts need to be nicely adjusted and all the details such as non concentricity, ovality or plating thickness need to be taken into account to reach the level of precision required by the L’Epée products. Large and precise CNC machines are needed to mill and form all the details of each piece. There are many kinds of machine operations, each of which can generate a certain part geometry and surface texture. L’Epée is using the best of these techniques.

All the milling tools have a special cycle quality program to ensure that the level of precision needed over the range of displacement is still within control (SPCs).

A large portfolio of machines is required to be able to manufacture all the details that compose all the clock’s parts. As the final assembly of a L’Epée Clock has to be perfect.

All the dimensions of all the parts need to be very accurate. So the workers handling such machines have to be well trained.
L’Epee Clock are known worldwide for the quality of their polishing.
Polishing is typically one of the challenge for large pieces. The difficulties of reaching a perfect surface are exponential to the extent of the surface. It is well known in horology that the polishing is a hard process to control and it is even harder when parts become heavy and large. It takes 3 to 4 years of education for a polisher to reach the level of knowledge for polishing large pieces without changing the original dimensions of the piece.

L’Epée products are well known for their high standard of quality and the beauty of their decorations. In the L’Epée wide collection, lots of different decorations can be seen. The finishing of those decorations are up to the highest standard in horology.

The most common ones are:
• The fine polishing (which is also one of the hardest one)
• The Côtes de Genève decoration (for which special tool and process have to be developed because of the size of the L’Epée clock components.)
• The pearls etc...
And they are all mastered by the L’Epée Team.
Each L’Epee Clock component is going through a heavy cleaning and inspection procedure before going out of the decoration department.
Cleaning is a key to get a beautiful and homogeneous plating.

Once polished, all the parts need to be separated, inspected and prevented to touch each other as a simple touch may mark them.

A strict inspection is made on every single part that composes a L’Epée clock to ensure that they all reach the level of quality required by the brand. The inspection is carried out after polishing and after plating. They can then be stocked and used later on during the assembly process.

Once the components are decorated, they need to get a final cleaning to reveal the beauty of the material and to avoid contamination of the plating.

All the parts that compose the movements are either plated in Gold or Palladium. An undercoating of Nickel is required to avoid diffusion of the gold or palladium within the solid brass. This undercoating of Nickel is important to ensure that the product will keep its beauty for generations to come.

L’Epée clocks are well known for their durability and their value across ages. Since 1839, L’Epée is known for its very high quality standard which has always been a priority by its Management.
The L’Epee manufacture has developed its own lacquerin workshop to be able to respond to its high level of quality.
L’Epee Le Duel - Lacquering

Lacquering is a major step in the production of the cabinet

The lacquering process is an important one in the production process. The transparent varnish is used to protect the brass parts against oxidation and it allows a long lasting life to the clock's cabinet.

New type of lacquer have been developed within the manufacture such as deep blue and deep pink lacquer, soft touch, old steel color...

After a thorough cleaning, the L’Epée components are lacquered by an experienced craftsman.

The lacquering is done in a high pressure clean room to avoid dusts contaminating the lacquer and assure the quality.
High control air flow room is needed and special filters are used to assure protection of our nature.
Once the parts are individually lacquered they are placed in oven for few hours to assure polymerization that will lead to toughness of the surfaces.

Therefore, the L’Epée clocks will keep their beauty for many generations to come.
The most advanced technique of metrology is used to ensure the quality of the L’Epee masterpieces.
L’Epee Le Duel - Metrology

Very demanding tests are conducted to satisfy high requirements

Each L’Epée clock follows a very demanding and systematic inspection conducted in the workshops. It testifies the extremely high standards of quality and reliability that L’Epée is known for. Each single component is tested to ensure the level of accuracy needed for a L’Epée product. Several tests are made for the right dimensions, aspect...

Once the parts have been manufactured for a L’Epée product, they go through several tests such as dimensions, visual aspect and composition.

Different equipments are needed to measure the tolerances of each piece that composes the clock. For the most complex ones, visual programmable automatic equipment is used to ensure capabilities and precision.

For the simplest ones, the basic metrology equipment is used. And when needed, L’Epée is sub-contracting to specific labs the testing of the parts such as measuring the thickness of the different layers of plating through the scanning election microscope (SEM).
A special Rotomat equipment is used to store and protect all the finished components that will be used to manufacture a L’Epee Clock.
Managing the parts that compose each clock is a challenge.

Some L’Epée Clock contains more than 600 parts in solid brass or steel and they need 4000 manufacturing processes. No wonder, the most accurate system of managing the components is required.

L’Epée has chosen a computer driven Rotomat to help selecting the right references. It also helps in managing the status of each component and the number of manufacturing processes each one needs to go through before being assembled.

Left and underneath picture: L’Epée also has meters and meters of shelves dedicated to old components used in After Sales Service.

Once the parts have been manufactured and quality approved, they need to be stored up to the time the watch-maker will be able to assemble them. They also need to be protected from deterioration or vibrations that can generate scratches or other damages. The mechanical shelf is an effective way to protect and store the components at the same place.

The mechanical shelves are also a nice way of using the volume for optimum storage as it makes use of the available room height to store components.

A key code access allows tracking who and when each part has been used.

It also helps in managing the components and can be driven by a computer to avoid confusion between different references.
L’Epee movements are assembled by Master watchmakers who have gained a long experience in adjusting sophisticated mechanical movements.
L’Epee Le Duel – Movement Assembly

The assembly of L’Epée movements is carried out by the master watchmakers.

A L’Epée Clock movement contains more than 600 parts in solid brass or steel, needing 4000 manufacturing processes. No wonder, the clockmakers are highly qualified craftsmen producing real masterpieces of traditional Swiss clockmaking art.

Each movement is fully assembled by one watchmaker from the beginning to the end. The same watchmaker will also add on it the complication. He will also be in charge for adjusting all the parts to ensure a perfect fit.

Each movement is fully assembled by one Master watchmaker from the beginning to the end.
The assembly process is a long step beginning by the assembly of the wheel to the axis and finishing by the adjusting of the penetration of the teeth within each wheel.

Once assembled and finally adjusted, each movement is controlled (Amplitude and Marche) and placed in running-in mode for 8 days. Then the movement is retested and shall fit within the range of performance dedicated to the specific caliber. If it does not reach it, then it goes back to a second watchmaker to rework it before going back to the same test.

Once approved, the movement is going to be fitted with the hands and will be tested for its power reserve. At the end of those 8 days, the movement will be embedded within the clock case and retested for its power reserve.
Each L’Epee Clock is fitted with an elaborated mechanical movement.
L’Epee Le Duel – In case Assembly

L’Epée clocks are skillfully assembled piece by piece to ensure the best quality.

The assembly of the clock has to be precise and gentle to avoid any damages on either the movement or the case.

The movement and the case are separately assembled and tested. Once both of them have successfully passed the testing phase, they are assembled to give birth to a magnificent L’Epée Clock.

The attention to detail prevails. Therefore, the assembly will not interfere with the performance of the movement: the perfect combination of both will ensure the long lasting life of the L’Epée Clock.
All L’Epee Clocks are subject to a series of technical tests and visual inspection to verify their accuracy.
L’Epee Le Duel – Final Testing

All the L’Épée Clocks are subject to series of technical tests and visual inspection throughout their manufacturing process.

To ensure the best performance to its clocks, L’Épée has developed series of technical tests on the movement itself as well as on the finished clock.

A L’Épée clock is not delivered before having successfully passed all the L’Épée quality requirements.

The accuracy of a clock is important. It is determined by the regularity of its amplitude. A clock that is fast or slow is considered precise as long as its amplitude regularity is constant. The advance or delay can be easily corrected.

To ensure zero defects for its end products, all the L’Épée Clocks are going through series of technical tests and visual inspection.

As a clock is much more than just a good movement embedded in a case, many demanding tests are implemented to ensure the quality of the movement and of the clock.

Once the movement is assembled and tested as such, it is embedded within the clock case. Once this step is completed, a new series of technical tests and visual inspection are made to verify the rate accuracy, the power reserve, the amplitude and the overall appearance.
**The Power-Reserve Indicator**

The Power-Reserve Indicator can be seen at 6 o’clock. It is at its maximum when the two swords cross to form the logo of the brand. When they separate, the angle between the swords opens gradually and after 40 days of autonomy, it is time to surrender!

The logo has been reversed and the 2 swords are pointing down.

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**The Double Retrograde Second**

The Double Retrograde Second depicts two crossed swords keeping step with time for 20 seconds before returning instantly to the “en garde” position.

The animation of the Double Retrograde Second begins its 20 seconds cycle by 2 swords ready to fight in the “en garde” position.

Then the 2 swords begin to move towards each other and cross as it is done in fencing.

At the end of the 20 seconds, when the 2 swords are reaching the logo display, they both jump back to the “en garde” position to begin a new cycle.
L’EPEE
1839

When Know-How becomes Art