

Manufacturing Processes at Surgimax

Surgimax is manufacturing surgical instruments with different manufacturing processes through machining and manual application. There are many steps which are to be followed for an instrument production to get it in final shape from raw form before packaging and shipping to end consumer which are listed below for your kind consideration: -

1) Steel manufacturing

The first and foremost step is selection of quality stainless steel to give best basis for a quality instrument we made at Surgimax, in order to be the leader in surgical instruments design and manufacturing we produce our own special high grade steel as per international required standards for surgical instruments manufacturing. All stainless steel compositions are tested in our laboratory before we sent it for forging process. However; we also use Japanese and German stainless steel which we import directly from our trusted and reputable sources.

2) Forging

This is also very important and crucial manufacturing step which actually makes the initial shape of instrument. Surgimax forging unit receives the pre-cut / fabricated lengths of stainless steel sheet or stock bars in desired gauge for forging process which are heated in small specialized furnaces. When they reach to a specified temperature, they are inserted over hammering dies where they are hammered as per dies having exact size, shape, and geometry of the instrument. This mold / die which we used in hammer for forging is made from high strength die-steel and is a critical component in maintaining tight tolerances in the final products.

3) Inspection

After forging process and before sending it's for annealing, a visual inspection of forged instruments is made to ensure that forged instruments are as per desired pattern and measurements.

4) Annealing

Forged surgical instruments are then annealed in vacuum furnaces. These furnaces are typically batch-furnaces where batches of forged instruments are annealed under vacuum to prevent corrosion. Annealing is a process which makes Stainless Steel soft for machining. This is a slow process where forged pieces are heated to a pre-determined temperature and later allowed to cool down very slowly over a period of time. The cool down stage sometimes take more than 10 hours based on the type of material. When annealed properly, the grain structure of Stainless Steel grows to a larger size which allows for easy machining and makes it ductile for forming, shaping, and sizing in the later stages.

5) Milling / machining

Annealed products are machined and milled based on the requirements of the final design. Special high-speed cutters are used for introducing teeth, serrations, ratchets, box-joints etc. Milling machines are equipped with pneumatic clamps which hold the products in place as they are being milled and machined.

6) 1st Grinding

Once the products are milled and machined, they are next grinded using high speed medium-coarse grinding wheels and belts. This process is used to remove any excess material left in the forging process and also to size the instruments as per the required tolerances and make it ready for filing process.

7) Filing

Once raw shape of the instruments is defined by coarse grinding, highly skilled technicians take the adjoining pieces of instruments and set them together. At this stage, the final shape of the instrument immerses and is bound together using screws or rivets in case of forceps and scissors. The serrations, ratchets, and teeth are also aligned and straightened in this step to form the perfect fit. This process is used for getting accurate size, design, weight and pattern of instrument. After filing instruments are inspected according to measurement of the semi finished instruments / master sample for consistency in measurements. This is one of the most important aspects of handcraftsmanship as it requires years of training before technicians are allowed to work independently.

8) Inspection

After filing instruments are once again inspected for defects in running lots to identify and take corrective actions accordingly.

9) Heat Treatment

Instruments when sized and set for perfect fit are then heat treated in highly sophisticated furnaces. Heat-Treatment furnaces can either be continuous (belt operated) or batch depending on the volume and size of the instruments. Typically, this process is carried in an inert environment (Nitrogen or Argon gas filled) to avoid oxidation and corrosion of final product. This process is used to harden the annealed instruments as per the final requirements.

This is also an important step as the hardness of the instruments must be within a few degrees. Excessive hardening causes the instruments to break in operation and lower than permitted hardness prohibits proper operation / cutting of instruments.

10) Hardness test

After annealing as well as heat-treatment, the instruments are tested using diamond-tipped rockwell hardness test fixtures to ensure proper hardness of instruments. Surgimax quality control team send instruments to independent testing institutes as well to validate the results.

11) 2nd Grinding

Hardened instruments are next grinded (using fine and extra fine wheels and belts) to remove deep scratches from the medium-coarse grinding/sizing in the previous stages. This step is also used to size the product as per the requirements. Typical tolerances of ± 2 millimeters are achieved at this stage of processing.

12) Electro Polishing

After 2nd grinding instruments are then electro polished which is a process of smoothening the surface anodically of instruments in required chemical solution and gives a shiny look which also removes burs from instruments.

13) 1st polishing

When instruments get electro polished, they are moved to polishing section where Surgimax experienced workers gives the finish shape to instrument and make it smoother through use of different polishing equipments.

14) Passivation

Once the instruments have been finished / 1st polished, they are next subjected to either chemical or boil tests depending on the type of instruments. These tests are conducted not just on a representative batch rather on all the instruments produced to insure superior quality. Just another example of how we do not compromise when it comes to quality!

15) Sand blasting

After passivation the polished instruments are transferred to sand blasting unit where the joint, teeth and ratchet of instruments are sand blasted to give them matt look and protect from corrosion while usage. Sand blasting is effective for removing light or dark spots over instruments surface.

16) Edge breaking

This is the process where sharp edges are removed through use of specialized machines to make the instruments smooth from all ways to avoid any failure during use.

16) Alignment and inspection

Alignment is a process where instruments are adjusted in terms of teeth, ratchet, box joints, and movement in order to give perfect functionality to instrument while intended use. During this stage any instrument that does not pass the initial QC is sent back to an earlier step depending on the corrective action.

17) 2nd Polishing

After alignment and inspection process all the instruments are polished as per the final requirements either to a mirror polish, satin or sand finish.

18) Ultrasonic Cleaning

Once an instrument gets to this stage, it is primarily a finished product and is next subjected to deep cleansing and decreasing of oils and finishing materials in water or chemical based ultrasonic cleaning machines before sending it for final inspection.

19) Final Inspection

After final cleaning / decreasing, instruments are thoroughly hand-examined with microscope and tested by a highly qualified team of QC inspectors. Each and every aspect of an instrument is examined including serrations, ratchets, jaws, and teeth while testing the cutting, grasping, moving functions.

20) Labeling

All the instrument that are approved by the final inspection department are finally laser or stencil marked with Surgimax logo and product code. Surgimax also provide OEM services where instruments are supplied with customer brand names under their exclusive packaging.

21) Packaging

Instruments are then packed in polythene bags and thermal labeled with item name, code, description, and batch / lot number to give maximum information to consumer while usage.

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