

Fabricating the Traditional 20K Piston

A traditional 20K piston is constructed using four different raw materials to make six fabricated components including:

- Machining one outside liner on a CNC lathe.
- Machining one piston head on a CNC lathe.
- Machining one piston bottom on a CNC lathe.
- Seventeen unique operations to fabricate the three liners required to construct one piston.
- Thirty-seven unique operations to combine each of the previous parts into one complete piston.

Each unique step in this process introduces a possible point of failure which may cause a shorter overall lifespan of the piston or result in suboptimal performance in the hands of the musician playing the instrument.

Coating the Traditional 20K Piston

After the traditional 20K piston is built, a coat of nickel plating is applied to the piston. The nickel is merely a surface coating that can – and does – wear away over time and requires either specialty repair or complete replacement.

The Traditional 20K Piston in Use

Using the traditional manufacturing method, small manufacturing and geometric variations are possible that can lead to the following issues for the musician:

- Imperfect porting alignment between the piston and the valve case.
- Inconsistencies in the windway – or the amount of open space inside each port through which sound waves travel – which can negatively impact the sound waves as they travel through the valve.
- Loss of compression because of multiple potential failure points: breaks in the solder joints between piston liners; nickel plating wear; and pinholes resulting from corrosion in the piston liner.

Fabricating the New 20K Piston

The new 20K piston is machined from a single piece of material. This material is a modern alloy, patented in the last 40 years as a material that exceeded the machinability of its predecessors while also being lead-free.

Each one of the former processes is now contained within a single CNC program, reducing possible points of failure and assuring quality and consistency.

Coating the New 20K Piston

The new pistons are anodized rather than nickel plated, matching the MIL-A-8625 standard that is used in aerospace, automotive, medical, and defense applications. This process creates a uniform, hard, and abrasion-resistant surface of a similar thickness to traditional nickel plating.

The New 20K Piston in Use

With the impeccable control and precision of CNC machining combined with the accuracy of anodizing, every piston produced will be identical.

The size and shape of the porting design is now totally defined by the CNC program and will no longer suffer the variability presented by traditional assembly practices.

The lightweight material allows for a completely solid design, maintaining a similar weight to the traditional 20K piston with no detectable changes to playability or function. The solid design has no potential for air leaks or loss of compression and offers improved resistance to dents or mishandling.

The new 20K piston has been cycle tested 100,000 times through multiple conditions, simulating what a piston would be exposed to over a typical marching band season. There was absolutely no change measured in the outside diameter of the piston, and no visible wear occurred to the anodized surface.

The following are the conditions in which the piston was tested:

- 100,000 times completely dry
- 100,000 times with saliva
- 100,000 times oiled using Bach Synthetic+ Piston Valve Oil
- 100,000 times with debris in the valve casing

Piston Service & Repair

The new 20K piston operates similarly to the older version.

- Customers will continue to receive a piston that is honed to a targeted size. Once the customer receives a honed piston, they will fit the updated piston to the instrument's valve using the historical method – hand lapping.
- The piston is backwards compatible and can be used in any 20K sousaphone. It accepts all of the traditional guide assemblies, valve stems, and top caps.