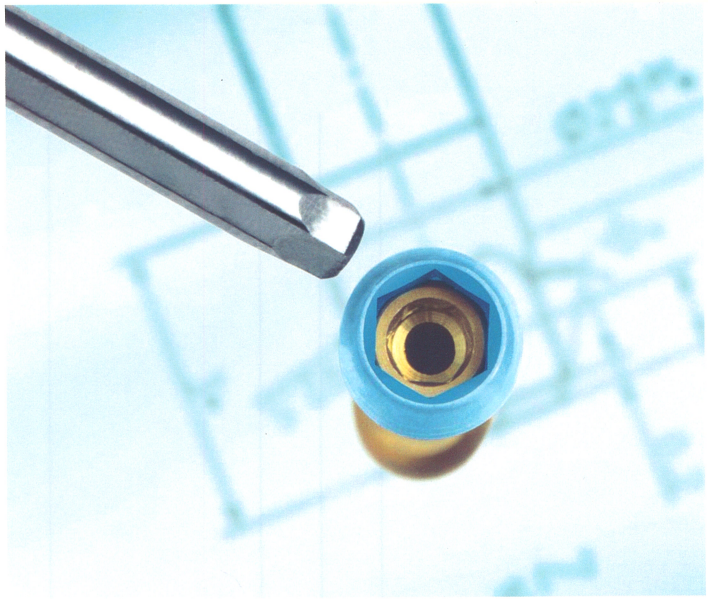
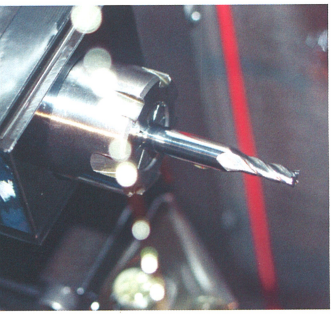
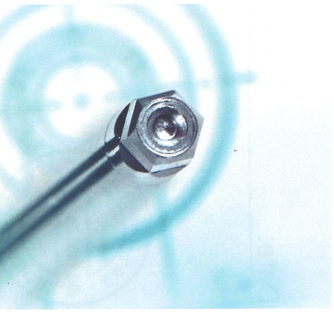


Realistic: fluid-optimized precision milling



The full carbide milling tool revolves at 6000 rpm, removing material for the conical external hexagon in a single pass.



The hexagonal prism is hardly recognizable to the naked eye – Fichter was thrilled to achieve top results on the first try.

They're still around, the suppliers who make the impossible possible in the "crazy" watch and medical device industries. If it's possible to do something with a machine tool, Horst Fichter Precision Turned Parts of St. Georgen in the Black Forest can do it. The company specializes in the production of ultra-precise medical device parts.

It is often small and mid-sized entrepreneurial subcontractors that have built up specialized expertise and a loyal customer base over decades. This expertise needs to be continually updated through close collaboration with experts in metals, tools, machine tools and machining fluids.

Conicity as safety feature

One good example of the challenges that arise in the production of parts for medical devices is an extremely difficult tool used in prosthetics. The workpiece is made of 1.4112 stainless steel and features a slightly conical hexagon at one end, only 2 mm in diameter. The conical shape between the tool and the bone screw ensures that the screw can't drop off once it is attached to the tool. This property is a key requirement for correct positioning of the screw.

Milling the outer hexagon

Fichter performs all the steps in working this tool on a TORNOS 13a. Dimensional tolerance in turning is an extreme challenge. In precision milling with a high-quality 2.2 mm diameter solid carbide mill, greater spread was found in the conical area at the end of each work step. As a result, the screws, which likewise have extremely fine tolerances in the hexagonal seat, were not always fixed securely to the cone of the surgical tool. The reject rate in milling was as high as 30 to 46%!

1.4112 stainless steel

This rust- and acid-resistant material (X90CrMoV18) is composed of

0.85 – 0.95%	C	(carbon)
1%	Si	(silicon)
1%	Mn	(manganese)
0.04%	P	(phosphorus)
0.015%	S	(sulfur)
17 – 19%	Cr	(chromium)
0.9 – 1.3%	Mo	(molybdenum)
0.07 – 0.12%	V	(vanadium)

and is of average ductility.

Switching to MOTOREX ORTHO

Every working parameter was reviewed – without success. The only remaining modifiable parameter was the machining fluid, with the tool, bar material, cutting data and programming all left unchanged. During the search for a new cutting oil, various experts recommended the unique high-performance ORTHO NF-X cutting oil from MOTOREX.

Enhanced tool service life…

Significantly longer tool service life was observed during the first eight hours of turning on the first machine filled with MOTOREX ORTHO NF-X, ISO 15 and during deep boring of a different part. Fichter's specialists eagerly awaited the outer hexagon measurements of the first series of the surgical tool produced with ORTHO NF-X.

…with hugely improved dimensional accuracy

When the milled hexagon was measured, the dimensional precision proved to be very high, a successful result. Measurement values were meticulously recorded, and the reject rate at the end of the series was a mere 5.8%! How was this possible?

Following a metallurgical and lubricant analysis in the MOTOREX laboratory and on the machine itself, it was determined that a special formulation contained in ORTHO NF-X specifically uses the heat generated by milling to increase high-pressure stability, with a beneficial effect on machining. This enables "gentler" removal of the material layer on the workpiece and thus an improvement in surface quality.

A look at the surface of 1.4112 stainless steel under an electron microscope clearly reveals an irregular structure. The lubricant film visibly cushions the hard impact of the milling tool as the material is carried away, protecting the structure of the material. The result: improved surface quality and dimensional precision.

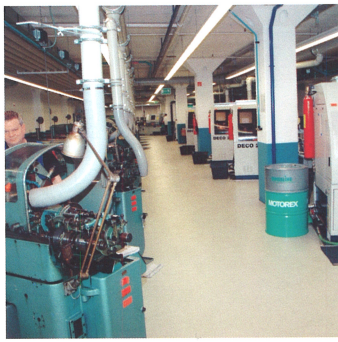
A well-rehearsed team

Horst Fichter depends on various generations of Tornos equipment, and the machine hall is filled with neat rows of carefully polished machines. The oldest sliding headstock lathe, a 1948 Tornos Model A, still performs its relatively simple duties with the same aplomb with which the latest Deco generation carries out highly complex work processes. The Fichter turning shop has used MOTOREX ORTHO NF-X since January 2006, benefiting from its many positive characteristics.

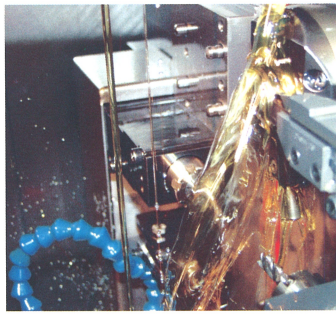
Hearing the proprietor talk about the quality and ingenious performance of his two Swiss suppliers, the listener soon understands why he relies on the established team of Tornos and MOTOREX.

Industry

The machine operator stays informed by taking regular measurements and keeping a measurement log.



Several generations of Tornos machine tools stand in neat rows at Horst Fichter Turning. There's even a 1948 Tornos Model A!



ORTHO NF-X: a critical success factor. It took decades for the complex fluid technology to reach today's level of sophistication.