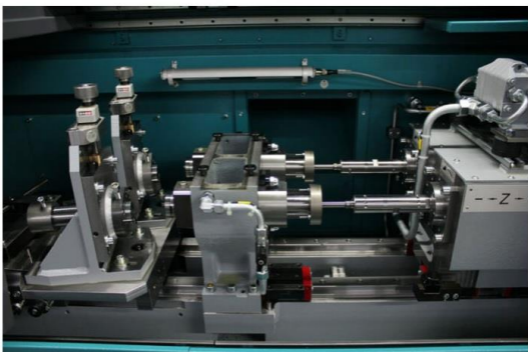


Tool shanks with interior cooling – an exigent drilling task

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TBT developing special device for standard deep drilling machine with four degrees of freedom

Chipping tools increasingly work with an interior cooling system. Manufacturing such tool shanks becomes a challenge because deep cooling channels with relatively small diameters have to be drilled. For some variants, tool constructors are even envisioning slanted drilling. TBT Tiefbohrtechnik in Dettingen/Erms has developed a special device for this task for drilling with single-line drills.

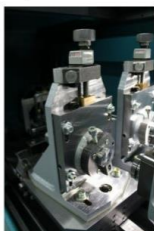
If the objective were to simply drill centric cooling channels, this would be a simple task hardly worth mentioning. However, tool shanks have become complex workpieces, the cooling lubricant must be optimally fed to the edges of the drill or cutter for which a centric cooling drill hole does not suffice. One manufacturer of such shanks was confronted with increasing challenges as a result. This manufacturer was commissioned with producing several variants with different shank lengths and diameters, as well as versions with eccentric drill holes, sometimes running slanted to the workpiece centre axis and in various distances to the centre axis. The diameters of the cooling drill holes vary with each tool for which they are intended, ranging mostly from 1.5 to 6 mm. This results in rather large length-diameter relations. Deep drilling technology with single-line drills is best suited for this task, as single-line drills run a superior course to conventional twist drills and frequently are safer drilling tools.

Since the manufacturer of the tool shanks was already using several deep drilling machines Type ML200 by TBT Tiefbohrtechnik in Dettingen/Erms, the new workpiece variants were to be manufactured on the basis of this machine as well. The machine is perfectly suited for tool shank applications. It is provided by TBT with one or several spindles, corresponding to drill diameters of 0.8 to 12 mm. Those dimensions provide flexibility in both directions in case the diameter range from 1.5 to 6 mm does not suffice. Dettingen-based TBT does not only manufacture machines but also serves as contact partner for all questions around deep drilling. This also applies for devices. As a consequence, this tool shank manufacturer requested a suitable solution from TBT which could be adjusted to the new, different workpiece versions and fit exactly with the intended ML200 in a two-spindle variant.

For the specialists at TBT, constructing devices is every-day business. However, providing a highly flexible solution in this instance was a challenging task. Some details: The drilling device had to provide four degrees of freedom: 360° rotation of the workpiece around the centre axis, height adjustment, cross adjustment and angle adjustment for the slanted drill holes in the horizontal. Cross and angle adjustment could be synchronous for both spindles. However, the rotation and height adjustment for both workpieces must be adjustable separately for each spindle. Andreas Schlegel, Sales Manager at TBT: "We strive to deliver complete solutions functioning at 100%, consisting of deep drilling machine, drilling tools and all other plant components. Apart from the devices, that may include components for automated production. In this case, the customer decided against an automated solution for cost reasons and commissioned us to install a manual device."

The diameters of the coolant drill holes in a tool shank frequently differ (see Fig: d1, d2). The user claps the workpiece and drills from both sides. A stop ensures exact positioning. A clamping screw fixates the cylindrical shanks which are equipped with a milled groove for this purpose. The version shown has a drill hole with d1 slanted and outside of the centre. At the centre of the workpiece, it meets drill hole with d2 which is also eccentrically positioned to the centre axis but parallel to the axis. The difficulty: The slanted d1 drill hole must meet the d2 drill hole exactly at this position to prevent impermissible tightening of the cross-section.

Due to the vastly varying drill depths of the different workpiece variants, the user employs the drill bush in two ways: For depths up to approx. 200 mm, immersion sleeves are used which feed the drill bushing to the workpiece using springs. To drill deeper, the user disassembles the immersion sleeves and uses a sealing case. In this case, there is also the option of installing a bezel for supporting the deep drilling tools.



The device constructed by TBT offers four degrees of freedom for workpiece adjustment. The image shows the scale for the 360° rotation of the workpiece and the counter for height adjustment. Image: TBT



Andreas Schlegel, Sales Manager at TBT: "We strive to deliver complete solutions functioning at 100%." Image: TBT

All in all a prime example for the high art of device construction. "Our solution includes quite a few ingenious details," says Andreas Schlegel. "All deflections are quite simple using scales or the digital display and can be adjusted with precision." Since even small angle deflections will cause large axial misalignments in long workpieces, the available space in the ML200 was initially a hot topic of discussion. However, the engineers were able to combine all the requirements, quality and available space. The user does not have to invest into a larger machine – that was one of the main requirements. "And for all drilling processes, the serial protective hood still closes," adds Andreas Schlegel with a smile.

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