

Single setup eccentric turning



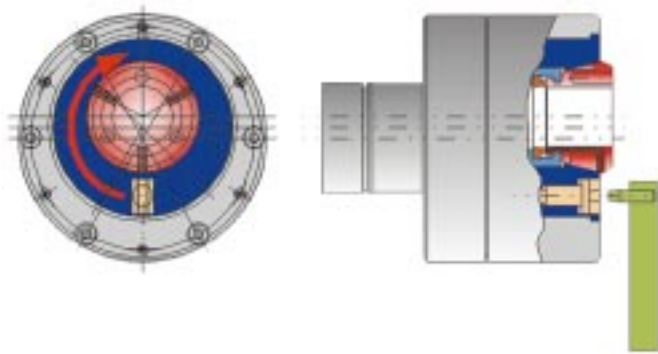
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The turning of eccentric diameters puts high demands on machining technology. These parts are normally machined in eccentric collets or special chucks. For parts with various eccentric diameters, a stunningly simple solution is now available using CNC technology.

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For machining of parts with eccentric diameters, various solutions have been available to-date using eccentric collets in the machining spindle and elaborate gear drives or hydraulically operated adjustments working against fixed stops, which allowed an eccentric positioning of the workpiece axis. These solutions are not only elaborate and expensive, but are also inflexible, and limited to a specific eccentricity. In most cases, the machining of the second side of the workpiece required a separate machining operation.

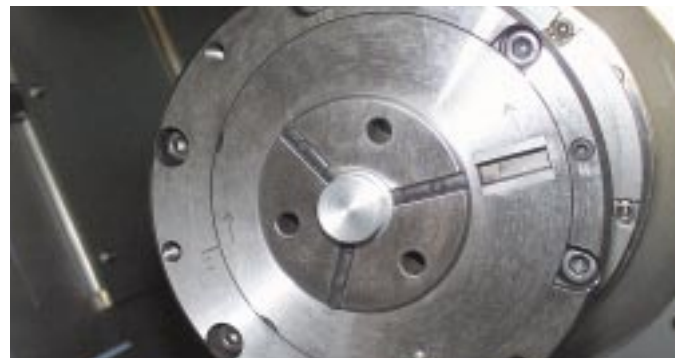
INDEX now has developed, in conjunction with the Hainbuch collet manufacturer, a very simple and smart solution, which, for the first time, allows the complete machining of parts with eccentric diameters in one single setup. This new solution also for the first time allows the machining of various eccentric diameters with different eccentricities.

*Mahmoud Ragab
At INDEX in Technical Sales
the inventor of the eccentric
chuck: "The simplest solutions
are often times the best. We
probably should have had this
idea earlier to use the C-Axis
for eccentric adjustment.*



Stepless adjustment of eccentricity with C-Axis

The solution is really very simple: on the counterspindle equipped with a C-axis, a collet chuck is mounted consisting of a body with an eccentric bore and another chuck body inside the collet chuck, which is also eccentric. The inner chuck body is designed for mounting of a standard quick-change collet. The trick is that by turning the inner chuck body relative to the outer body, different eccentricities relative to the spindle center line can be accomplished with an accuracy of less than .02mm/.001 inch. In order to rotate the inner chuck body, the collet chuck is stopped and positioned. An adjustment tool, mounted in the turret, is engaged into a keyway located in a radial position on the face of the inner collet body. Subsequently, the collet chuck is rotated by means of the C-Axis, using a preprogrammed canned cycle in the CNC control, until the desired eccentric position of the collet chucking diameter is accomplished. The adjustment tool is then retracted and the machining process can begin. Of course, in between the adjustment various other operations must be performed, such as opening the collet, monitoring the adjusting position and closing of the collet. The closing of the collet is accomplished by means of a draw tube which is activated with app. 200 kg / 440 lbs. of force. The force, acting on the draw tube, is transferred to the collet so that it is drawn into the taper, generating a defined chucking force for the part. If the workpiece axis has to be adjusted off-center from the spindle axis, the collet chucking has to be locked



The keyway on the face of the chuck which is used to hold the inner body of the eccentric chuck.



To hold the eccentric inner body, an adjustment bolt is engaged in the keyway.



Complex turning with drill mill operations can be combined



with eccentric turning and complex cutoff side machining

so that any movement of the workpiece is avoided because the part remains chucked even though the chucking force actuation is de-activated.

The time for the complete cycle for an eccentric adjustment on the INDEX G200 machine is app. 8 sec. The eccentric chucking system can be installed on the main spindle or on the counterspindle. In most cases, slugs cut-off from barstock or casting blanks are machined. In certain limited applications, parts with small eccentricities of .5 to 1 mm / .020 to .040 inch can be machined from barstock up to 3 m bar lengths / 10 ft.

Eccentric Chuck Perfectly Balanced

With eccentric machining, the imbalance is normally a significant drawback. This is not the case with the existing eccentric chuck; the complete chuck with collet and all parts included are always perfectly balanced since during the adjustment, parts are only rotated against each other. This does not create an imbalance in the chuck. The chuck itself always acts as if it was made from one solid piece, so that the chuck can be perfectly balanced. Only the part itself could produce a slight imbalance, in which case the spindle speed has to be limited.

Operation sequence

1. Chuck is stopped and positioned.
2. The adjustment tool in the turret is engaged in the keyway.
3. The draw tube in the spindle is released.
4. The chuck is rotated by means of the C-Axis into a defined eccentric position. Meanwhile, the workpiece remains chucked due to the chuck locking mechanism.
5. The collet chuck is activated again with the draw tube.
6. The adjusting tool is retracted.
7. The workpiece can be machined in the eccentric position.
8. The workpiece is returned by means of the eccentric chuck adjustment procedure back into the concentric zero position.

Several Eccentric Diameters on One Workpiece

With this eccentric chuck, different eccentric diameters with different eccentricities and angular positions can be machined. In these cases, the adding of any kind of adjustment error for the different eccentric positions is avoided since the chuck is always returned to the zero position, where it is locked mechanically before the next eccentric adjustment. If the eccentric diameters are in different angular positions, an additional adjustment is required as follows: after machining of the first eccentric diameter, the workspindle is returned to the zero position. While holding the part with a separate gripper, which is also mounted in the turret, the collet is opened. The spindle is then turned again by means of the C-Axis into the desired angular position and the collet is closed and the workpiece chucked. Thereby, the next eccentric diameter to be produced will be offset by the angular adjustment, which was made by turning the chuck and collet relative to the workpiece. Both the eccentric turning as well as the angular adjustment can be repeated several times. For the function of the eccentric adjustment, INDEX has applied for a patent. The main advantage is that this type of chuck can be utilized on any CNC turning machine equipped with C-Axis and an adjustment tool.

Eccentric Chuck Produced by Hainbuch

The renowned precision chuck manufacturer Hainbuch, as described above, produces the eccentric chuck. This offers the advantage that a wide range of standard quick-change collets can be utilized.

At the moment, the chuck is available in two sizes, 42 and 65 mm, respectively 1-5/8 and 2-1/2 inch capacity, both for bar and chuck work. The maximum adjustment range is from 0 to 15 mm / 0 to .590 inch. Other chuck sizes are in development. Even on CNC multispindle machines, these types of chucks will be available.



Typical eccentric workpiece

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