

Precision Grinding in Turn-Mill Centers



With
BAHMÜLLER
Grinding Technology

Turn-Mill Center

The advantages of integrating various types of chip removing machining processes such as turning and milling in one machine tool are well known. This technology has led to the development of the turn-mill centers. With additional tool carriers and tool changers, these machines offer the flexibility of machining centers. Both rotation-symmetric and cubical workpieces can be machined, with high efficiency. Since these parts are machined in one cycle without additional chucking and handling, expensive fixturing and alignment procedures for secondary operations are avoided. Repeated chucking does not reduce form and location tolerances.

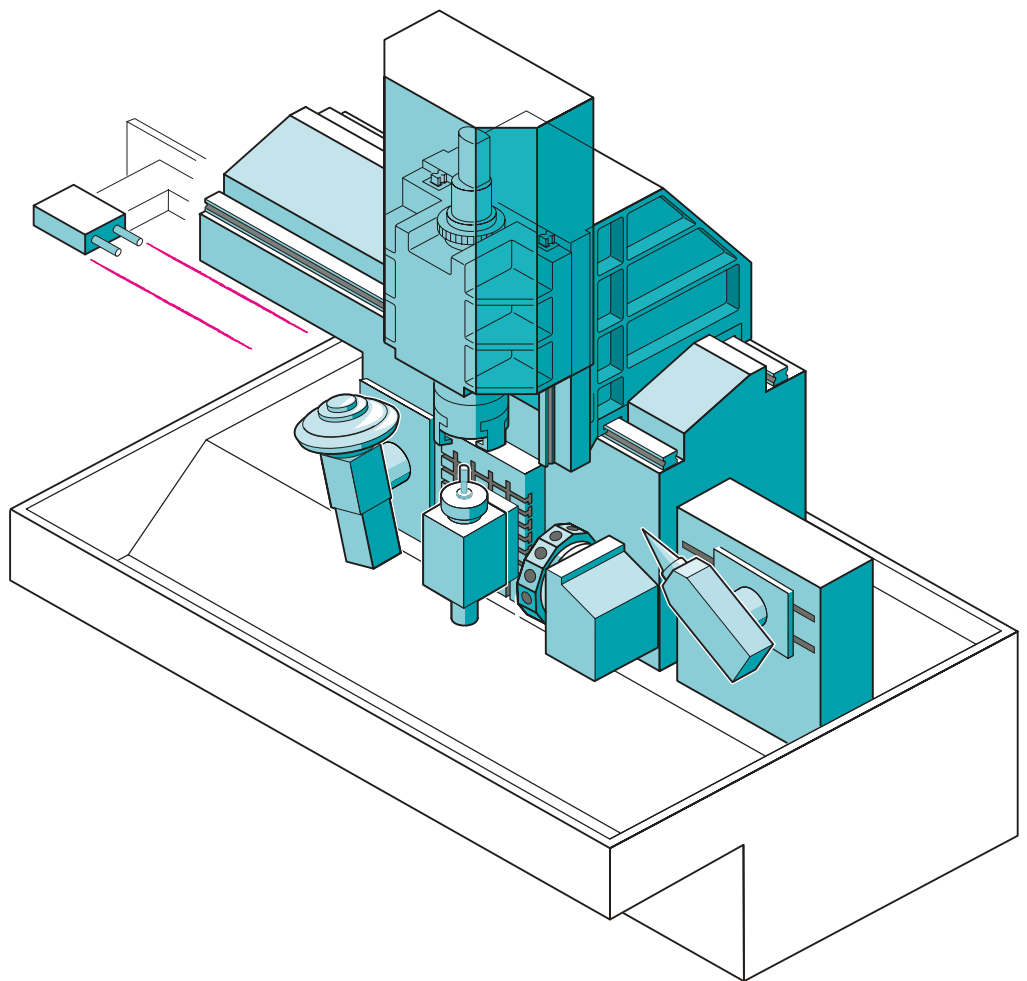
Integration of other machining processes

If workpieces need additional grinding operations, or heat-treating with subsequent grinding, the limits of complete single process operations on a turning center will be reached.

This is why additional machining processes such as Laser hardening and precision grinding performed on a vertical chucker turning center offer even more cost savings. In those cases where other operations such as hard turning are combined with precision grinding, significant savings in the machining time can be achieved, in addition to the well known advantages of performing combined operations in one chucking. The stock for grinding can be reduced to 1/100 mm / a few thousands of an inch. Procedures such as zeroing or touching off with the wheel can be eliminated.

Laser hardening

Using a diode laser with 2-3 kW power, O.D., I.D. and face surfaces can be hardened. The process parameters such as feed rate and power can be programmed via the CNC control. Due to the high efficiency of the diode laser, big chilling units are not required. The connecting power of the machine only increases by 10 kW.

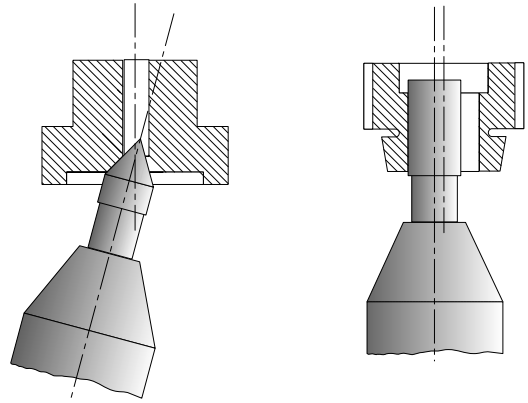


INDEX / BAHMÜLLER Joint Venture

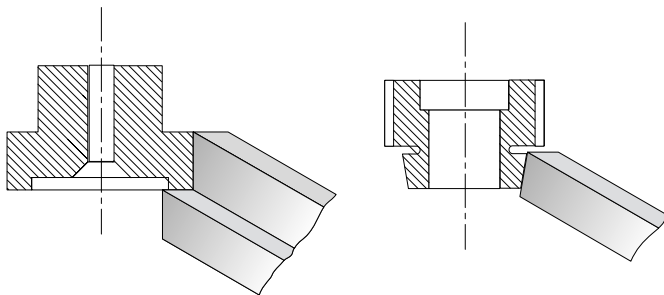
In cooperation between INDEX and BAHMÜLLER, a modular grinding component kit was developed and tailored to the INDEX machine requirements. This complements the existing know-how of INDEX, in turn mill operations, with the BAHMÜLLER precision grinding technology.

Grinding Component Kit

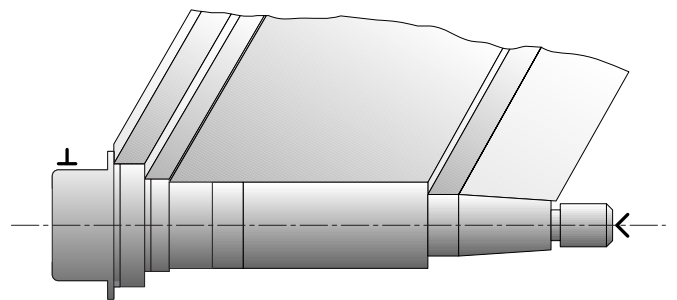
The movements during the grinding operation are programmed in the X-Z plane in the same way as with turning. The operator, when familiar with turning, can learn to use the grinding components (spindles) with minimal training. Machining cycles typical for grinding are supported by the INDEX C200-4D control. O.D. grinding spindles can be equipped with conventional wheels or with high speed CBN wheels up to 40 mm / 1.57" width and 400 mm / 16" DIA (see picture 2/4). The grinding process is automatically monitored with sound sensors. As an option, an electromechanical balancing head for automatic balancing is also available. The grinding spindle is supported by 4 precision spindle bearings with 85 mm / 3.34" bore with high static and dynamic stiffness. The spindle is driven by a servomotor via a belt, and reaches 6000 RPM and a max. power of 7.5 kW.



Picture 3: I.D. Grinding



Picture 2: O.D. Grinding



Picture 4: O.D. Form grinding

The I.D. grinding spindle component (picture 3) for use of conventional or CBN wheels, is equipped with a very rigid and accurate HSK32 adapter, for manual or spring clamping. Grinding and dressing processes are monitored and controlled by sound sensors. The spindle has the design of a motor spindle with a stiff bearing support. Depending on application and process specific requirements, speeds up to 80,000 RPM and power up to 12 kW are available.

The universal wheel dresser for conventional, as well as CBN wheels, is mounted on the headstock.

The automatic in-process gauging system is used for monitoring of part accuracy and control of tool offsets.

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