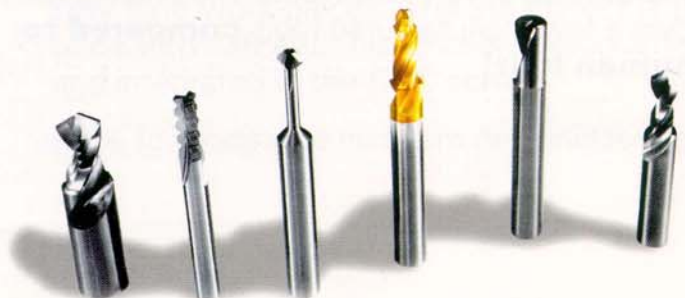


TTB

Engineering



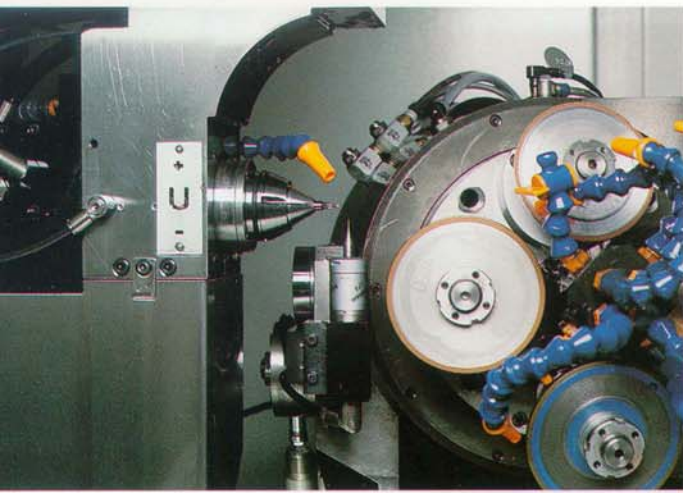
**High precision
Tool-Grinding - Center
TGC 5 with 5 axes
TGC 6 with 6 axes**



**The TTB-TGC Tool Grinding Center
an ultra-high precision machine
Outstanding machine features are:**

- *Special construction of the linear axis - no "backlash" in all axes*
- *Positioning repeatability 0.001 mm, respectively 0.001°*
- *The workpiece spindle allows round grinding*
- *Four grinding spindles are integrated in spindle turret*
- *Up to three grinding wheels can be mounted on a grinding spindle*
- *Exact positioning at change of grinding wheels*
- *Complete grinding of workpieces with complex geometry's needs only one workpiece setup*
- *Grinding of miniature tools down to \varnothing 0.02 mm*
- *High speed spindle up to 100,000 RPM*
- *Automatic measurement-system integrated in the machine*
- *Automatic manufacturing and sharpening of standard and special tools*
- *High autonomy through the use of up to ten grinding wheels*

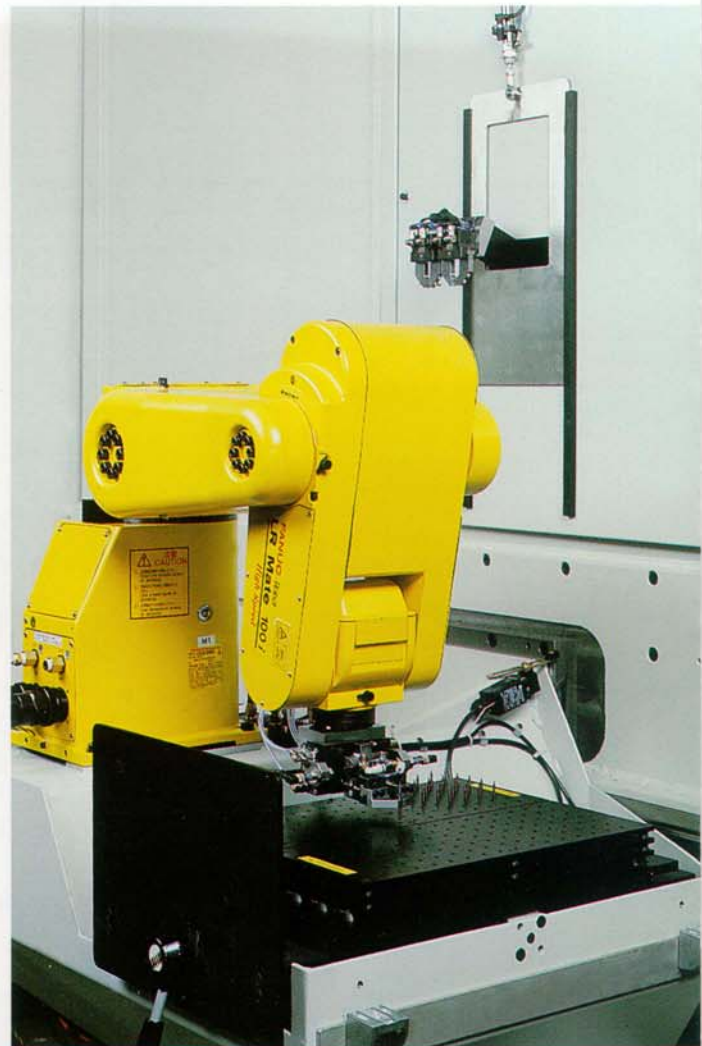
TTB



Measuring-System

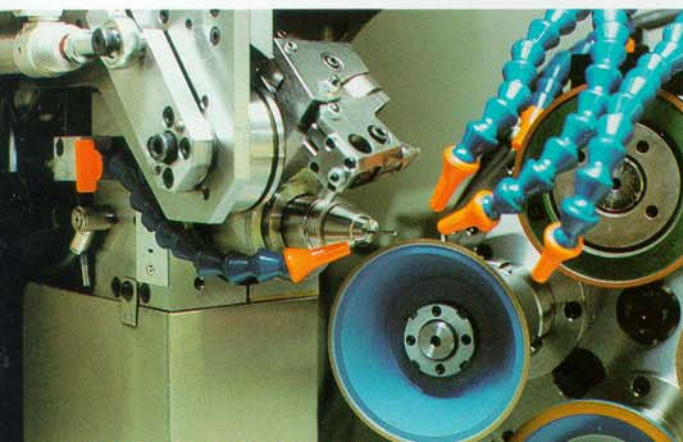
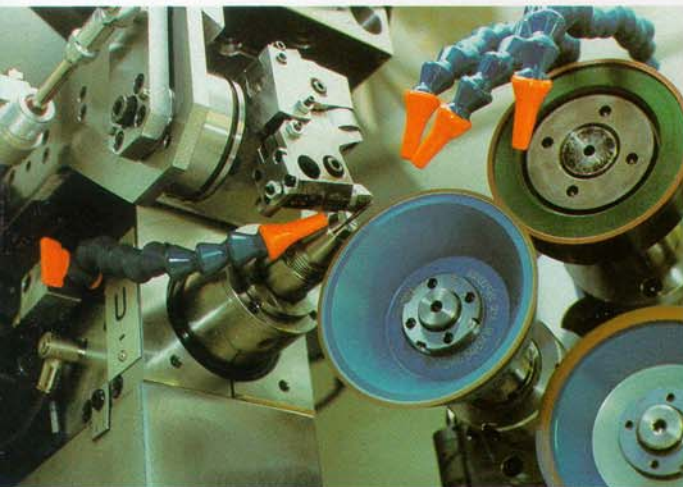
The integrated measuring system is used for the determination of diameters, lengths and to position the tools.

The system is required for sharpening of tools and for the use of the TGC in automatic manufacturing. Various measuring programs are available to cover diverse applications.



Loading-System

A flexible handling system allows fully automatic manufacturing. A robot takes the workpieces from a pallet and hands them to the loading system. The loading system then inserts them in the workpiece holder. The grinded tool is placed back on the pallet in a similar manner.



Automatic support "steadyrest"

The **TTB-TGC** machine uses a support for the grinding of very small (e.g. less than 1mm Ø) or very long work-pieces. The steadyrest is put in place automatically. This function is programmable and integrated in the CNC control.

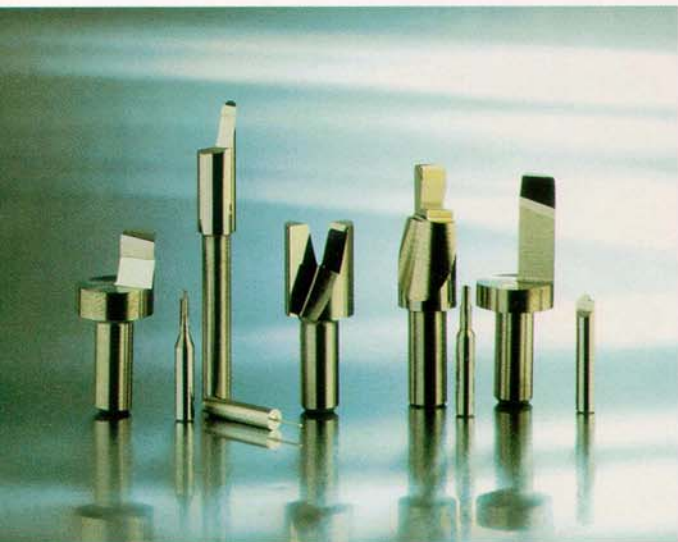
Tool range

The **TTB-TGC** is mainly used for the manufacturing and sharpening of rotational and non-rotational cutting tools (standard and special). The tool range runs from miniature and special tools via standard tools to larger tools up to 14 mm diameter. All tools can be completely grind in one setup. This allows an economical operation. With larger tools it is recommended to prepare the flutes before grinding on the TGC.

Applications

The **TTB-TGC** is used in the following applications:

- Manufacturing of standard and special tools
- Tool sharpening
- Manufacturing of deep-hole drills
- Manufacturing of tools for the automobile industry (Injection nozzles, break systems, hydraulic systems etc.)

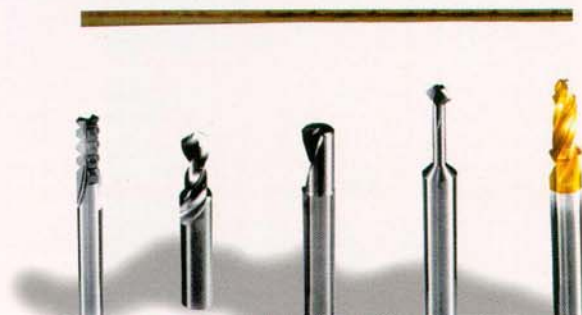


- Writing instruments industry
- Watch and micro-mechanical industry
- Medical instruments
- Extrusion nozzles for the manufacturing of synthetic fibers
- Manufacturing of various precision components

An example of manufacturing of miniature tools

The **TTB-TGC** is market leader for the manufacturing of very small tools. The photograph shows a few manufactured tools **compared to a human hair!**

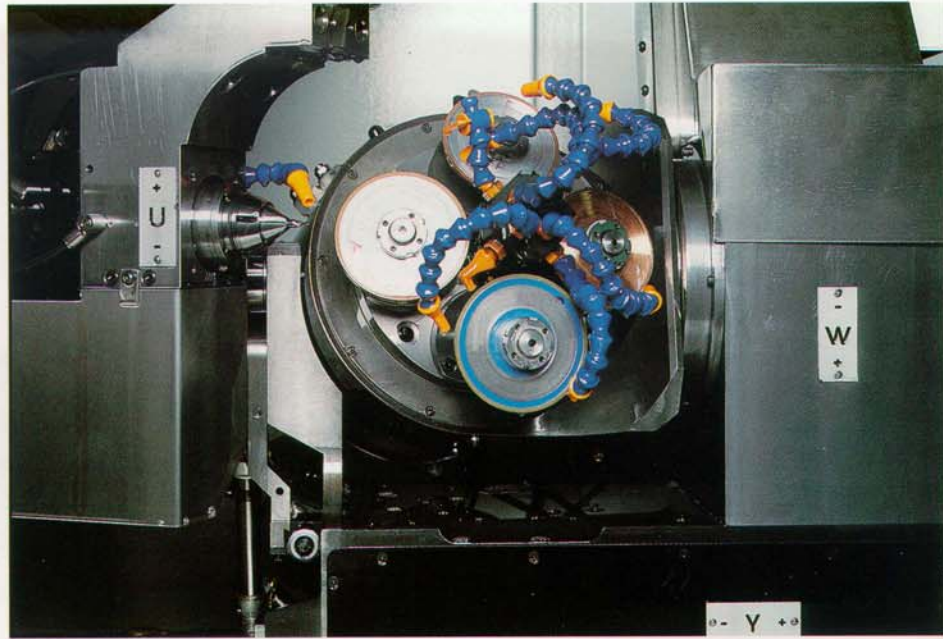
The machine can maintain tolerances of $\pm 1\mu$.



Spindle turret and grinding spindles

The spindle turret carries 4 different grinding spindles. In order to gain working space the spindle axes are angled with respect to the turret rotation axle.

The indexing accuracy of the spindle turret head is secured by a high-precision "Hirth" coupling. The indexing motion of the turret is bi-directional.



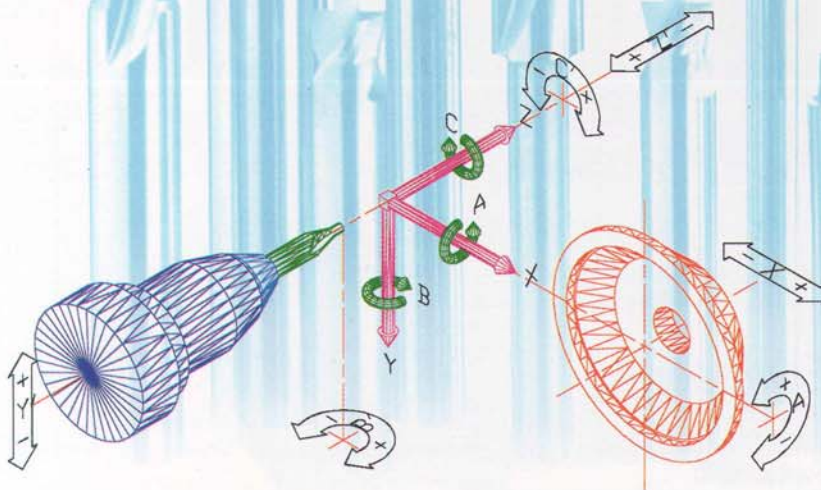
The maximum speed of a standard grinding spindle is 12'000 RPM. This speed is programmable. For special applications any of the spindles can be replaced by a high frequency spindle. Several different versions up to 100'000 RPM are available as option.

Workpiece spindle

An AC digital motor drives the workpiece spindle (C-axis). Its speed is programmable between 0 and 1'500 RPM. This configuration allows cylindrical grinding in one setup.

The unique design of the rotational B-axis allows the grinding of tools with left- or right hand helix without restrictions.

The physical location of the workpiece spindle nose in relation to the centerline of the B-axis allows placement of the tool for most grinding applications in the center of the rotation of the B-axis. This arrangement results in excellent surface condition during interpolation of the B-axis.



TECHNICAL DATA

Linear axes

Longitudinal slide traverse (Z - Axis)	250 mm
Cross slide traverse (X - Axis)	250 mm
Vertical slide traverse (Y - Axis)	150 mm

Rotational axes

Tilting of the grinding spindle turret (A - Axis)	+/- 20°
Rotational range of the grinding head (B - Axis)	240°

Workpiece spindle

C Axis - Rotational speed	0 - 1500 RPM
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Feedrates

Linear axes (Z, X, Y - Axes)	3 m/min
Tilting of the grinding spindle turret (A - Axis)	12'000°/min
Tilting of the workpiece spindle (B Axis)	6'000°/min

Smallest travel increment

Linear axes (Z, X, Y - Axes)	0,0001 mm
Tilting an rotation (A, B, C - Axes)	0.0001°

Repeatability

Linear axes (Z, X, Y - Axes) for Positioning	+/- 0,001 mm
Tilting axes (A, B - Axes)	0.001°
Rotation axis (C - Axis)	0.005°

Spindle turret and grinding spindles

Number of grinding spindles	4 (5)
Power rating of motors	3.7 kW (5 kW)
Programmable speed up to	12,000 RPM
Number of grinding wheels per spindle (max. Ø 100 mm)	1 to 3
Turret indexing time	1 sec

Workpiece spindle

Hydraulic operated collet system	W 20 (W 25)
Alternative collet systems	on request
Clamping Ø	14,5 (19,5) mm
Clamping length	max. 300 mm

Applications

Tool Ø	0,02-18 (22) mm
Reshaping Ø	3-25 mm
Machining length Ø	max. 150 mm

CNC-Control

GE-Fanuc Model 16i M (160i M) with 6 simultaneously interpolatable axes, 128 kB Memory, Programming according to DIN 66025 with MACRO's- for the use with special user program
Dialog-software on request
Drives: GE FANUC, Brushless digital.

Operating controls

9" (12") Display, Symbols according to CE-Standards.
Operating panel according to CE-Standards with all machine functions.

Dimensions and Weight

W = 2'500 mm, H = 2'200 mm, D = 2'000 mm, Weight 3'700 kg.

High precision TTB - TGC "Tool - Grinding - Center"

The **TTB-TGC** (Tool-Grinding-Center) with 5 or 6 axes has been developed especially for the short or medium production runs of carbide tools. The machine is usually applied for the manufacturing of tools with a diameter of up to 14 mm. Smaller tool diameters can be handled without significant lower diameter limit.

A special spindle turret holds 4 spindles for the grinding operations. This allows the use of multiple grinding wheels on each spindle. The different wheels can be used under program control as required.

The linear axes are moved using a specially designed system with pre-loaded linear guides. This, combined with the hydraulically pre-loaded screw spindles, guarantee no backlash and excellent positional repeatability.

The system allows the manufacturing of very complex tools, including cylindrical grinding, in one setup.





Your dealer

Ihre Vertretung

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