

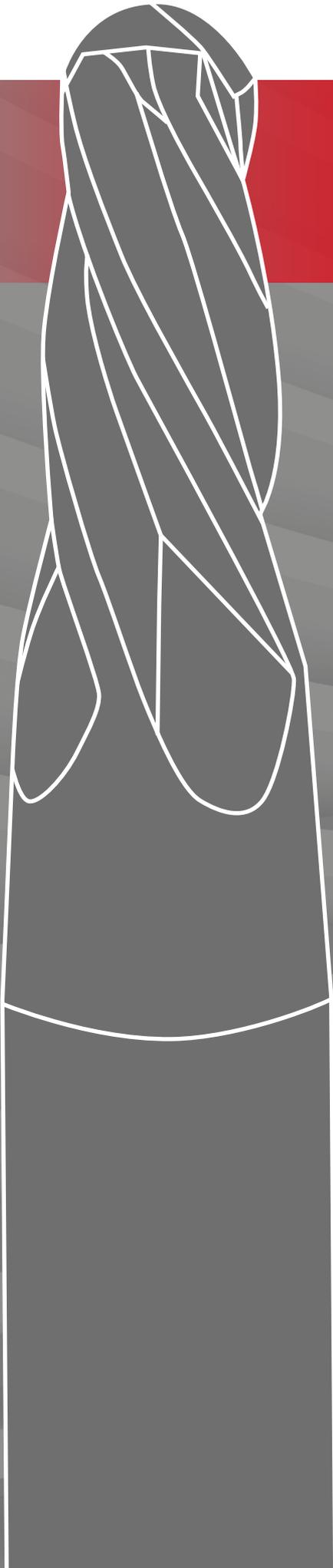


S20+

For economic, high-precision
production and reshaping



**NEW: with FANUC
or NUM Control**



S20+

***IDEAL FOR PRECISE,
PROFITABLE GRINDING***



The S20+ is a combination between the proven S20 features and new, intelligent and optimized solutions in design, equipment and accessories. It holds the know-how and the joy of innovation of more than 60 years spent in designing and building of high-quality and ultra-modern tool grinding machines. The further development of the S20+ was focussed on decisive advantages such as versatility, precision and productivity. They form a basis for the S20+ to guarantee its users the crucial competitive edge that ISOG is famous for.

The versatility of the S20+ is logically continued by the offer of two different control and software alternatives: with FANUC control and optimized MTS software, or as a NUM version with NUM control and NUMROTOplus software.

Vertical = Ideal

Vertically arranged machines offer their users decisive advantages: They are of compact design, ensure optimum sturdiness, and they facilitate ideal movements of their axes.

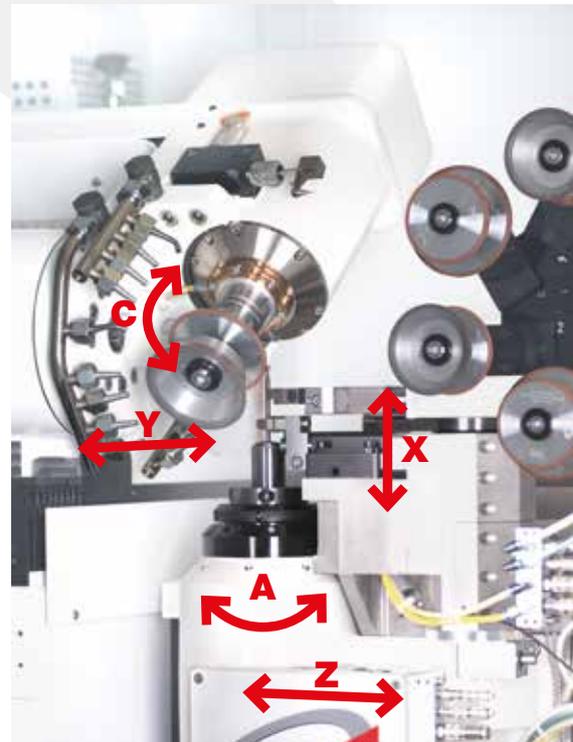
In addition, the vertically arranged tool shows less radial runout and offers best user-friendliness – a concept that ensures the user utmost precision and easy working.

Ingenious & well thought-out

Having a directly driven grinding spindle, an integrated six-station wheel changer, an advanced design, automation solutions offered by chain loader systems or a robotic loading cell, a modern control system and efficient software, it is the ideal choice for the profitable and highly efficient manufacture and resharpener of demanding tools.

Precision package for microtools

In addition to a great variety of intelligent accessories, options for the high-precision grinding of particularly small tools are now available. By glass scales used in the linear axes, a defined spindle stop, a hydraulic clamping chuck, a runout optimizer and a steady rest, the S20+ opens up the ways to the production of smallest tools (down to 0.3 mm in diameter).



THE S20+.

MAKE USE OF ITS STRONG POINTS TO YOUR BENEFIT

- ▶ Patented vertical design.
- ▶ Ideal machine kinematics.
- ▶ Sheet steel based mineral casting frame for very good vibration damping.
- ▶ High metal removing capacity by a direct, high-torque grinding spindle drive.
- ▶ Six-station wheel changer as a standard feature for up to 18 grinding wheels.
- ▶ FANUC or NUM control with corresponding software.
- ▶ Digital drives for utmost operating dependability.
- ▶ Directly driven A- and C-axes.
- ▶ Direct position measuring system
- ▶ Height-adjustable operator panel.
- ▶ Flexible automation by an integrated chain loader or
- ▶ Robotic loading cell suitable for production.
- ▶ High-precision package for the production of microtools.

QUICK CHANGING FOR MORE PROFITABLE GRINDING



The standard feature six-station wheel changer with its quick-hanging system makes the S20+ an efficient grinding centre where tools of various geometries and materials can be machined.

HSK wheel arbors

By using high-precision HSK wheel arbors, the selected wheel package is precisely coupled to the grinding spindle with absolutely no play.

When an RC1250 robotic loading cell is being employed a tilting wheel changer can be used. This will cut the already minimal changing time.

A defined spindle stop is another option to further improve precision in wheel changing.



AN OVERVIEW OF THE WHEEL CHANGER ADVANTAGES

- ▶ Integrated in the machine (room-saving and quick).
- ▶ Up to six wheel packages.
- ▶ Up to 18 grinding wheels.
- ▶ Utmost clamping precision due to HSK wheel arbors.
- ▶ Program-controlled.
- ▶ Intelligent grinding wheel management using ID numbers.
- ▶ Replaceable changer wheels available.
- ▶ The changer wheels can be loaded outside the machine.
- ▶ Easy assignment of completely equipped changer wheel packages to your grinding task.
- ▶ Equipped wheel changer packages can be easily stored in your tool cabinet.

Automatic workpiece detection by an electronic probe

This electronic probe is self-calibrating and automatically detects the geometric shape of the workpiece clamped in the indexing head. In addition to the radial and axial workpiece positions, the software calculates all essential workpiece data.

Automatic measuring of the:

- ▶ workpiece clamping length,
- ▶ tooth position,
- ▶ flute depth and flute length,
- ▶ face direction,
- ▶ profile,
- ▶ diameter,
- ▶ radial runout,
- ▶ helix pitch,
- ▶ irregular pitches,
- ▶ position of the cooling duct hole,
- ▶ position of the long cutting edge going to the centre.

The measuring system is self-calibrating and allows for complete or selective acquisition of tool data.



A-axis direct drive by a torque motor.

Ultra-modern direct drives on the indexing head (A-axis)

- ▶ Direct drive by a torque motor.
- ▶ Higher speed of 500 rpm.
- ▶ Infinitely variable speed control.
- ▶ Facilitating simple circular grinding.
- ▶ Higher precision by a direct drive and a direct measuring system down to $< 0.001^\circ$.
- ▶ Low-wearing.

Pneumatic five-jaw chuck

- ▶ Outstanding radial runout properties.
- ▶ Applicable to shank diameters of 5 to 20 mm.
- ▶ Ideal for use in conjunction with the chain loader.

FANUC OR NUM: TWO OPTIMUM CONTROL ALTERNATIVES!



The more efficient the control system is, the more profitable is the use of the tool grinding machine.

For the complex sequence of motions necessary for high-precision tool production or for perfect resharping, respectively, you will need the proper machine and even the suitable control system for the appropriate software.

Two different packages: FANUC or NUM:

The S20+ is available either as a NUM version using a NUM AXIUM Power control with NUMROTOplus® software or can be provided with a FANUC 31i-B5 control and optimized MTS software, the tool-kit PROFESSIONAL.

No matter whether you decide on the S20+ FANUC or NUM option, you will always work on high-performance PCs using Microsoft® Windows operating systems.

Multifunctional operator panel

- ▶ Clearly arranged and functional.
- ▶ Adjustable in height.
- ▶ Tilttable 15" TFT colour display unit, optionally available as touch screen.
- ▶ For non-tiring and reliable working.
- ▶ Trackball mouse.
- ▶ Direct access to significant function switches.

The FANUC 31i-B5 control makes the S20+ a considerably profitable machine in terms of accuracy, speed, reliability and operation. It supports the complex and extremely fast functions as are necessary for the production and resharpening of tools.

Properties such as „nano interpolation“ or „nano smoothing“ will give you higher accuracy and better surface quality.

Safety is an integral part of this software with no need to install any additional modules to this end.

Advantages

- ▶ Quick start.
- ▶ Short setup times.
- ▶ Convincing dependability.
- ▶ Improved surface quality.
- ▶ Shorter machining cycles.
- ▶ Higher efficiency.
- ▶ Easier maintenance.
- ▶ Short position control cycles.
- ▶ High resolution of the regulating system.
- ▶ Comprehensive technology from the CNC up to the robot.
- ▶ User interface remaining in the familiar ISOG design.
- ▶ Worldwide after-sales service.

FANUC



The NUM controls are custom-built and based on a wide range of products such as the CNC, drive amplifiers and motors from NUM that have been dovetailed with one another to an optimum.

They transfer the precision of the CNC onto the workpiece without any losses, thus forming a perfect system. The CNC systems from NUM are designed with the aid of efficient, modern and recognized technologies in order to accomplish even the most complex tasks in tool grinding.

Advantages

- ▶ Versatile, precise and fast.
- ▶ Complete systems (CNC, drives and motors).
- ▶ Interpolated techniques involving up to five axes (linear, circle, spline).
- ▶ Digital interface between the controller and the machine operator panel on optical fiber basis.
- ▶ Fast data interface (TCP/IP) for the transfer of measuring probe and grinding data.
- ▶ Integrated and extensive safety management (as per EN ISO 13849-1 and EN 61800-5-2).
- ▶ The design of the CNC platform has been focussed on tool grinding and is being continually enhanced.
- ▶ CNC control and NUMROTO tool grinding software from one source.

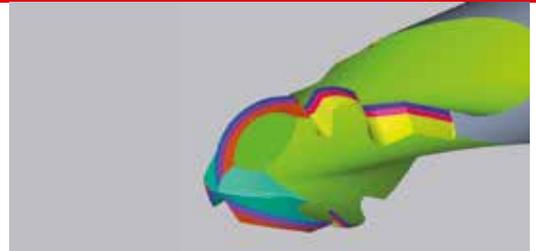
NUM 
CNC HighEnd Applications



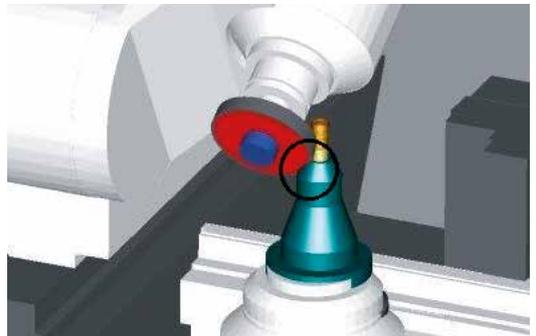
MATCHING THE CONTROL: THE SOFTWARE

TOOL-KIT PROFESSIONAL FROM MTS AG

- ▶ For manufacturing and resharpening almost any kind of tools.
- ▶ Complex cutter and complex drill software included in the S20+'s standard price.
- ▶ Modular arrangement for individual geometry machining.
- ▶ Easy input and programming.
- ▶ Quick program generation by a default function.
- ▶ Clearly arranged tool and grinding wheel management.
- ▶ Integrated 2D simulation.
- ▶ 3D simulation for easy construction of complex tool geometries (optional).
- ▶ Linking with collision monitoring as a standard feature.



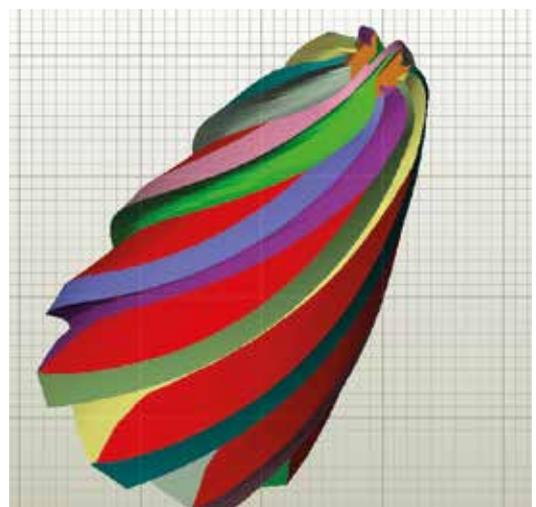
3D simulation (tool-kit PROFESSIONAL)



3D collision monitoring (tool-kit PROFESSIONAL)

NUMROTOplus® FROM NUM AG

- ▶ Extensive software for almost any grinding task.
- ▶ Exact and quick 2D section simulation at any position.
- ▶ Flexible and, nevertheless, logical programming.
- ▶ Help screens for any input value.
- ▶ Sensing and compensation of radial runout.
- ▶ Job manager for unmanned operation.
- ▶ Continual program updating with full compatibility.
3D simulation based on a real ISO code. (as an option)
- ▶ 3D simulation (as an option)



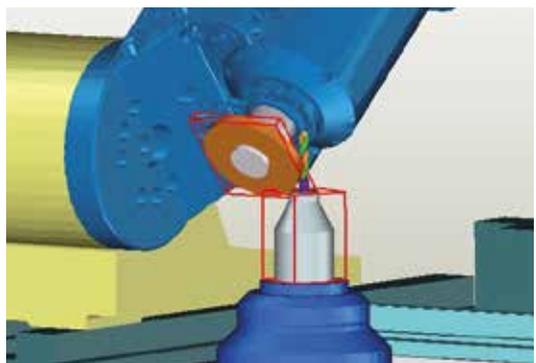
3D simulation (NUMROTOplus®)

Remote diagnosis via modem or Internet

- ▶ to support application technology.
- ▶ for quick and inexpensive troubleshooting assistance.

Electronic handwheel

This mobile control station allows you to move the individual axes by the handwheel or in the JOG mode – directly on the machine.



3D collision monitoring (NUMROTOplus®)

THE CHAIN LOADING SYSTEM: AUTOMATIC RESHARPENING



The automation solutions for the S20+ have been perfectly matched to various needs: The integrated chain loader system 41 has sufficient room for the reshaping of a variety of workpieces of various diameters and geometries.

Clamping options

- ▶ Schaublin collets:
For clamping uniform diameters within the range from 5 to 25 mm.
- ▶ Pneumatic precision five-jaw chuck:
For clamping various diameters from 5 to 20 mm.

THE KEY FEATURES OF THE CHAIN LOADING SYSTEM

- ▶ Room saving
- ▶ Easily accessible for quick loading and unloading.
- ▶ 41 workpiece locations.
- ▶ Infinitely variable tool diameters from 5 to 25 mm
- ▶ Workpiece length up to approx. 170 mm
- ▶ Changing time approx. 23 sec.
- ▶ Workpiece location coding.
- ▶ Vacant locations are possible.



THE ROBOTIC LOADING CELL FOR MAXIMUM PRODUCTIVITY



Simple automation for tool production. The RC1250 robotic loading cell with its five-axis robot from FANUC is most suitable for the automated production of bigger lots.



The cell is loaded with three pallets of workpiece blanks. The number of locations results from the types of pallets used and the tool diameter (for ISOG pallets and a diameter of 4 mm it is up to 600 tools).

The robot loads the tools directly into the clamping chuck. In this connection, a dual gripper ensures minimum changing time.

In combination with the options of

- ▶ a direct position measuring system in the linear axes,
- ▶ a defined spindle stop,
- ▶ a runout optimizer and
- ▶ a steady rest,

the S20+ becomes a highly-productive grinding centre for microtools.



M3 thread milling cutter/0,6 mm full-radius milling cutter

ACCESSORIES: WAYS TO OPTIMIZE PROFITABILITY

Infrared measuring probe



- ▶ for tactile measurements of grinding wheels,
- ▶ fully automatic correction,
- ▶ can be used for several machines,
- ▶ automatic changing,
- ▶ easy to retrofit.

Coolant ring



- ▶ Fixed coolant ring on the grinding head.
- ▶ 13 adjustable nozzles.
- ▶ Reliable coolant supply from different directions at a high coolant pressure.

Manually adjustable steady rest

- ▶ Automatic wheel change is possible (up to a wheel diameter of 100 mm).
- ▶ For precise grinding of long, thin tools.
- ▶ Can be quickly attached and removed.



A-axis coolant ring

- ▶ 9 adjustable nozzles.
- ▶ For the grinding of tools that demand much cooling.
- ▶ Facilitates high-precision loading into the chuck.
- ▶ Easy to retrofit.

Runout optimizer and steady rest

- ▶ Ideal for microtools
 - even with big clamping lengths.
- ▶ Radial runout $\leq 2 \mu\text{m}$
- ▶ Additional support by a steady rest is possible.
- ▶ Best suitable for use in conjunction with the RC1250.

Technical Specifications

Tool Grinding Center Type S20⁺

Version		F31 ⁺	S20NUM ⁺
Control System			
Type		Fanuc 31iB5	NUM Axium Power
Operating System		Windows 7 Ultimate	
Wheel changer			
Pneumatically supported		6 stations	6 stations
Clamping and grinding ranges			
max. workpiece diameter ¹⁾		approx. 250 mm	approx. 250 mm
max. workpiece length ²⁾		approx. 500 mm	approx. 500 mm
max. workpiece length for face grinding ³⁾		340 mm	340 mm
max. tool weight ⁴⁾		10 kg (50 kg ⁵⁾)	50 kg
Traversing range/measuring system			
X-axis	Grinding stroke	340 mm	340 mm
	Feed rate	10 m/min	10 m/min
	Drive	digital controller using AC motor	digital controller using AC motor
	Measuring system	indirect / direct (absolute) ⁶⁾	indirect / direct ⁶⁾
Y-axis	Resolution	0.0026 µm / 0.00005 mm ⁶⁾	<0.00005 mm
	Feed travel	240 mm	240 mm
	Feed rate	10 m/min	10 m/min
	Drive	digital controller using AC motor	digital controller using AC motor
Z-axis	Measuring system	indirect / direct (absolute) ⁶⁾	indirect / direct ⁶⁾
	Resolution	0.0026 µm / 0.00005 mm ⁶⁾	<0.00005 mm
	Feed travel	240 mm	240 mm
	Feed rate	10 m/min	10 m/min
A-axis	Drive	digital controller using AC motor	digital controller using AC motor
	Measuring system	indirect / direct (absolute) ⁶⁾	indirect / direct ⁶⁾
	Resolution	0.0026 µm / 0.00005 mm ⁶⁾	<0.00005 mm
	Feed travel	240 mm	240 mm
C-axis	Feed rate	10 m/min	10 m/min
	Drive	digital controller using AC motor	digital controller using AC motor
	Measuring system	direct (absolute)	direct
	Resolution	0.000045°	0.00005°
A-axis	Freely rotating, modulo function (0 bis 360° zählend)	360°	360°
	Feed rate (spindle speed at fast traverse)	500 rpm	500 rpm
	Drive	digital controller using torque motor	digital controller using torque motor
	Measuring system	direct (absolute)	direct/Encoder
C-axis	Resolution	0.000045°	0.00005°
	Swivel range	197°	197°
	Feed rate (spindle speed at fast traverse)	30 rpm	25 rpm
	Drive	digital controller using AC motor	digital controller using AC motor
C-axis	Measuring system	direct (absolute)	direct
	Resolution	0.000045°	0.00005°
	Swivel range	197°	197°
	Feed rate (spindle speed at fast traverse)	30 rpm	25 rpm
Grinding spindle			
Drive motor		direct-type	direct-type
Nominal power		7.1 kW (for a 75 % duty cycle)	7.1 kW (for a 75 % duty cycle)
Peak power ⁵⁾		9.1 kW ⁵⁾	9.1 kW ⁵⁾
Coolant		oil or emulsion	oil or emulsion
Sense of rotation		clockwise and anticlockwise	clockwise and anticlockwise
Speed		infinitely variable from 1,000 to 8,000 rpm optional: higher speed ranges	infinitely variable from 1,000 to 8,000 rpm optional: higher speed ranges
Dimensions			
Weight		approx. 3.300 kg	approx. 3.300 kg
Size (depth x width x height)		1,915 x 1,700 x 2,100 mm	1,915 x 1,700 x 2,100 mm
Robotic Loading Cell RC1250			
Robot model		FANUC Robot LR Mate 200iD 5	
Number of controlled axes		5	
Size (depth x width x height)		approx. 940 x 1,365 x 2,100 mm	
Weight		approx. 610 kg	
Repeating accuracy		± 0.02 mm	
max. carrying load		5 kg	

Explanations:

- 1) depending on tool type
- 2) max. projection length from the collet upper edge
- 3) depending on the workpiece position, the grinding wheel holding fixture and on the grinding task
- 4) depending on the moment of inertia
- 5) up to 30 sec.

Subject to modifications consistent with technical advance and errors excepted.

The representations and descriptions in this brochure partially include options with costs.

