



Flexible and universal

SCHÜTTE CNC 5-AXIS GRINDING MACHINE 325*LINEAR*

The 325linear allows you to ideally cover the diversity of the processes and clamping technology for your workpieces:

- Production and resharpening of material removal tools
- Pre-machining and finish-machining of production workpieces
- Grinding, mill cutting, polishing and finishing of implants
- Process-sure grinding from hob cutters to microtools



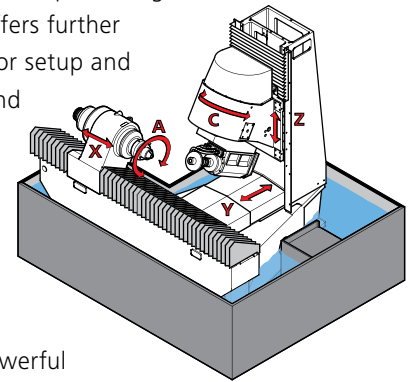
The 325linear grinding machine impress with their small footprint and large machining area.

Compact, versatile basic machine

The high-precision 5-axis CNC grinding machine of the 325linear series is extremely flexible and universal. This flexibility means that it can be used in almost all areas of modern industry. It therefore has a very wide use spectrum. From the production to resharpening of tools of all kinds to pre- and finish-machining of production workpieces – even with complex geometries and shaped elements.

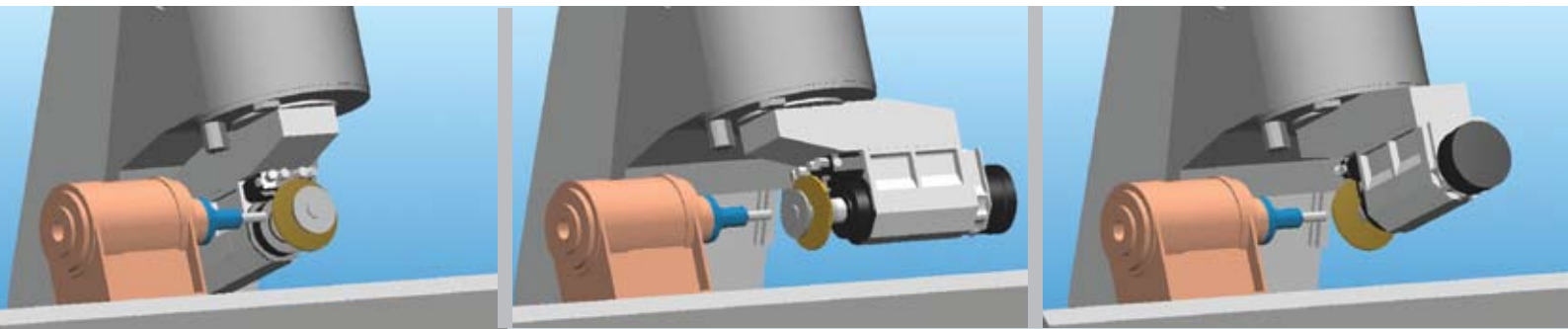
An important feature of the 325linear series is an immensely stable and, at the same time, compact design. The 30°-inclined grinding spindle allows the use of an extremely rigid axis structure and offers further advantages: a large machining area with a small installation space, excellent accessibility for setup and a very clear view of the grinding area. The 325linear series is equipped with 5 CNC axes and state-of-the-art digital control engineering. Schütte guarantees simple operation and programming of the machines thanks to the in-house developed software *SIGSpro*.

For high-precision grinding operations, the thermal stability of the machine is of vital importance. The stable basic structure of the machine contributes to this. The machine base forms a unit with the cooling lubricant tank, which holds more than 400 litres of temperature-controlled cooling lubricant. The heat sources in the machine, such as the powerful drive motors for the grinding spindle, workpiece rotation and swivelling axis, are also cooled to provide a constant and uniform temperature level in the entire machine structure.

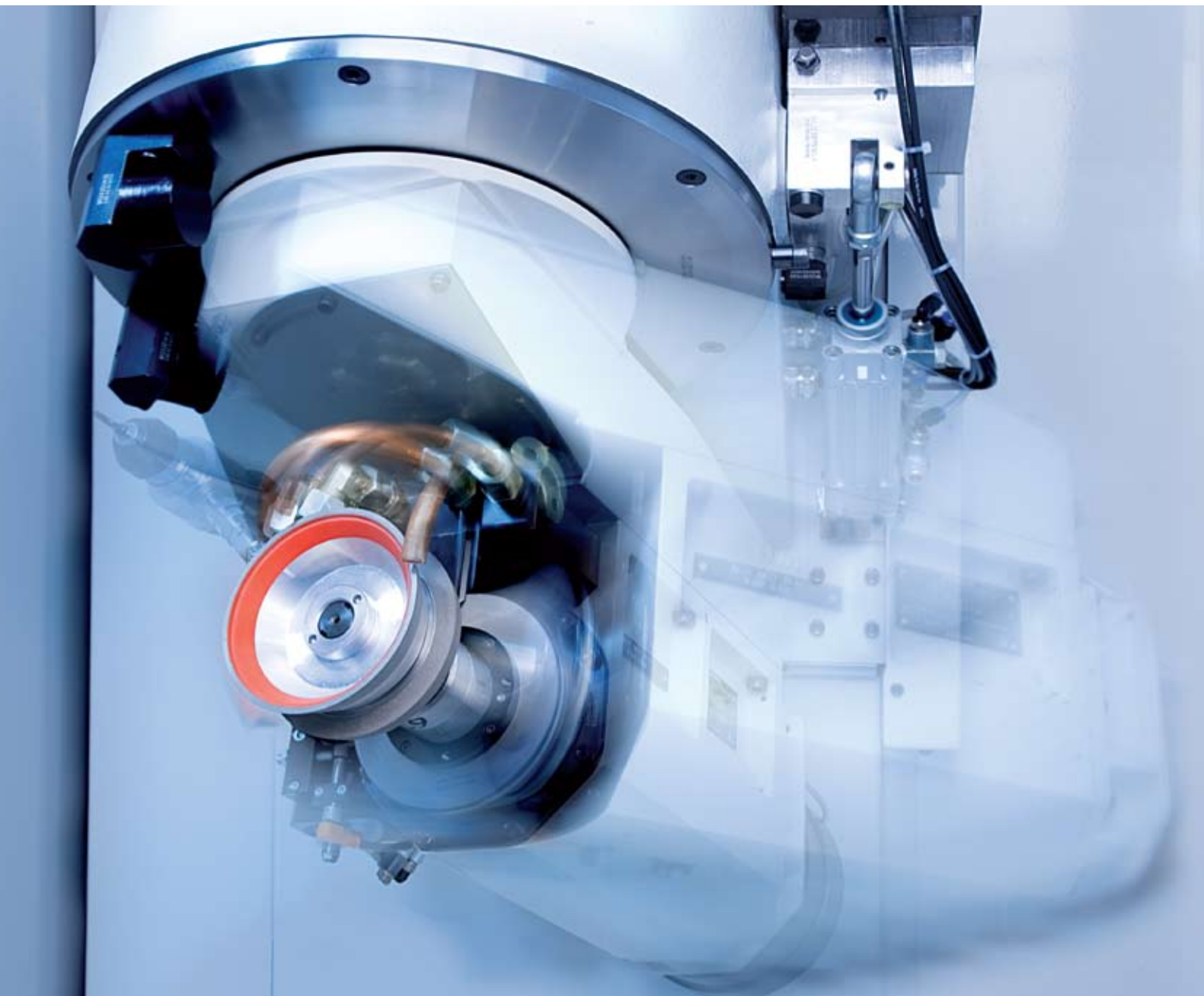


- Compact design – small footprint and large machining area
- Open machining area – clear view of the material removal process
- Optimised hood – excellent accessibility and simple setup
- Rigid axis structure and optimised power input – inclined swivelling axis
- Minimal compensating motion – optimised spindle swivel point
- Thermal stability – cooled drives and temperature-controlled machine base
- Simple handling – user-friendly Schütte software *SIGSpro*

USER-FRIENDLY, STABLE AND SPACE-OPTIMISED
THE SCHÜTTE 325LINEAR WITH THE SPECIAL AXIS ARRANGEMENT



The generously dimensioned swivel area of the grinding head allows all necessary positioning of the grinding wheel in relation to the workpiece. Rotational speed 12,000 min⁻¹, or 24,000 min⁻¹ as an option.



Powerful grinding spindle

With continuously increasing complexity and accuracy requirements in the area of grinding technology, the 325linear from Schütte perfectly meets the demands of a future-oriented market. Core components include the powerful, high-precision drives, which are exactly tuned to one another thanks to the software and control engineering.

All rotation drives are designed as digital direct drives and have high-resolution direct measuring systems. The high output of the grinding spindle of up to 15 kW at a speed of 12,000 min⁻¹ enables high material removal volumes and is even suitable for machining operations such as high-performance creep feed grinding. With an optionally available grinding spindle, speeds of up to 24,000 min⁻¹ are also possible, which allow the effective use of grinding points.

The HSK holder for the grinding wheels guarantees high accuracy of repeatability and offers fast manual or automatic changing of the grinding wheel sets. Special features at Schütte: the cooling lubricant nozzles are changed together with the grinding wheel set. This ensures that the optimum cooling lubricant supply is available for every grinding process even during an automatic change.



- Process-flexibility through automatic grinding wheel change
- Optimised cooling and lubrication through joint change of grinding wheel set and cooling lubricant nozzles
- High change accuracy thanks to HSK holder
- Speed up to 24,000 min⁻¹

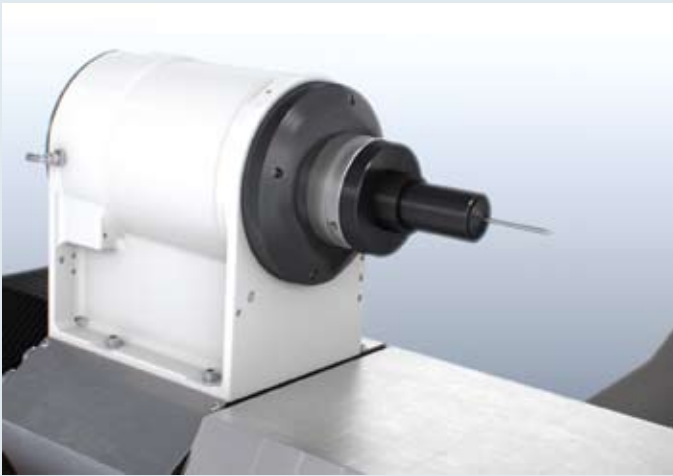
COMPACT AND POWERFUL



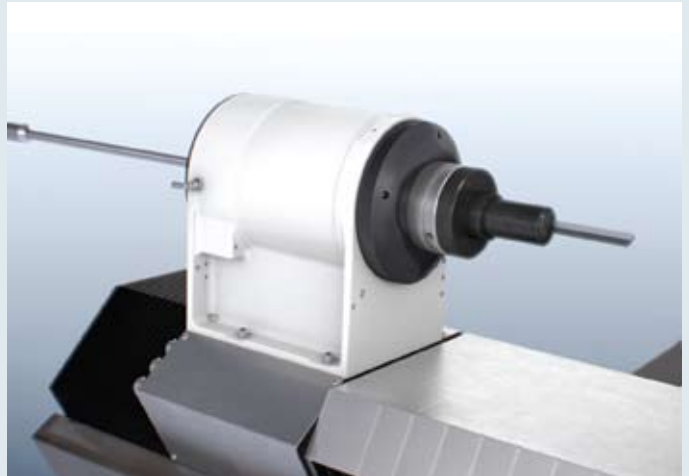
External cylindrical grinding



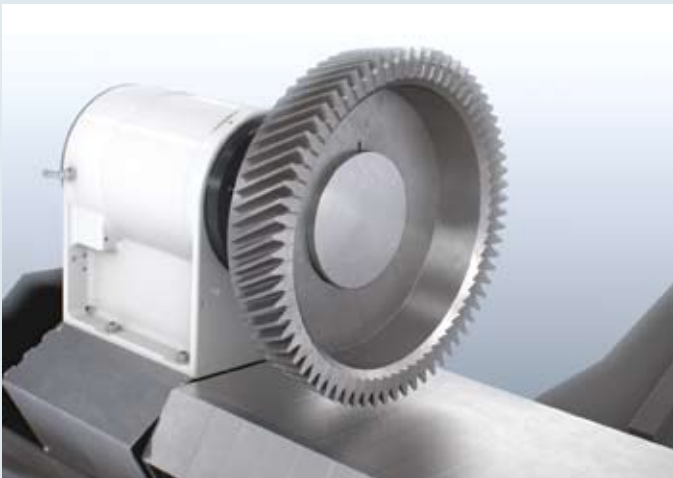
Internal cylindrical grinding



Microtools



Extremely long tools, clamped in a hollow spindle



Tools with a large diameter



Tools with a high mass

Universal workpiece axis

The main area of application for the 325linear is the manufacturing and preparation of cutting tools for the metal and woodworking industries. Thanks to its versatility, however, the machine is also used for the manufacture of a very wide variety of production workpieces, e.g. in the medicinal industry.

A wide range of options are available for the different applications for automatic or manual clamping, guidance, support or the workpieces. Work is possible with collet clamping, automatic multi-range chucks or high-precision hydraulic expansion chucks depending on the required concentricity accuracy and the given tolerances of the workpiece shank. Intermediate sleeves can also be changed automatically. For workpieces with a large length-diameter ratio, a tailstock and/or different support variations can be used that are either fixed under the grinding point or that move parallel with the workpiece.



With its high torques and excellent concentricity and indexing precision, the universal rotation axis for the workpieces permits efficient and very accurate process management, even in complex operations such as helical grinding or grinding tool contours and angles. At the same time, it can run at extremely high speeds up to a maximum of 2,500 min⁻¹. Cylindrical grinding operations such as cylindrical contour surface grinding or axial contour grinding can thus be carried out. The rigidity and dynamics are ideally tuned to one another, which allows a workpiece diameter range from 0.01 mm up to 200 mm (up to 280 mm as an option) to be covered.



- High torques, high indexing precision
- Suitable for cylindrical grinding and contour grinding
- Speed up to 2,500 min⁻¹

VERSATILE AND WILLING TO WORK



Foldable support



Fixed tailstock



Foldable tailstock



Two slides for pure flexibility

The solutions for clamping, supporting and precise guiding of the 325linear are as versatile and sophisticated as your workpieces.

For perfect clamping of all workpiece versions, the 325linear can be equipped as an option with one or two auxiliary slides. The auxiliary slide X1 can be used equally as a support slide or a tailstock slide. The support function is made possible by coupling the slide at any position you desire on the workpiece slide or on the machine base. The support can thus be used in a fixed position in relation to the workpiece (e.g. for end-face machining) or in relation to the grinding wheel (e.g. for grinding flutes). The tailstock function is implemented by a pneumatic auxiliary stroke.

The following clamping aids can thus be used on auxiliary slide X1:

Foldable or fixed support, foldable or fixed tailstock, workpiece guidance system, any combination of two of the above-mentioned variants, two foldable or fixed supports.

The auxiliary slide X2 can be configured as a tailstock slide or a pallet slide. In the tailstock slide version, a pneumatic stroke implements the clamping function; in the pallet slide version, the mounted workpiece pallet is moved from an NC axis during the loading cycle.

The attachments mounted on the auxiliary slides X1 and X2 can be combined with one another as desired. For each machining operation, operators can define which attachments are to be used in which positions.



- Two auxiliary slides in the X-workpiece axis
- Support function fixed in relation to wheel or workpiece
- Pneumatic auxiliary stroke for tailstock function
- Modular structure for flexible setup of the clamping aids
- Workpiece guidance system, supports, tailstocks and pallet
- Support and tailstock can be combined on a single slide

Application example of flute grinding:
Support fixed in relation to grinding wheel



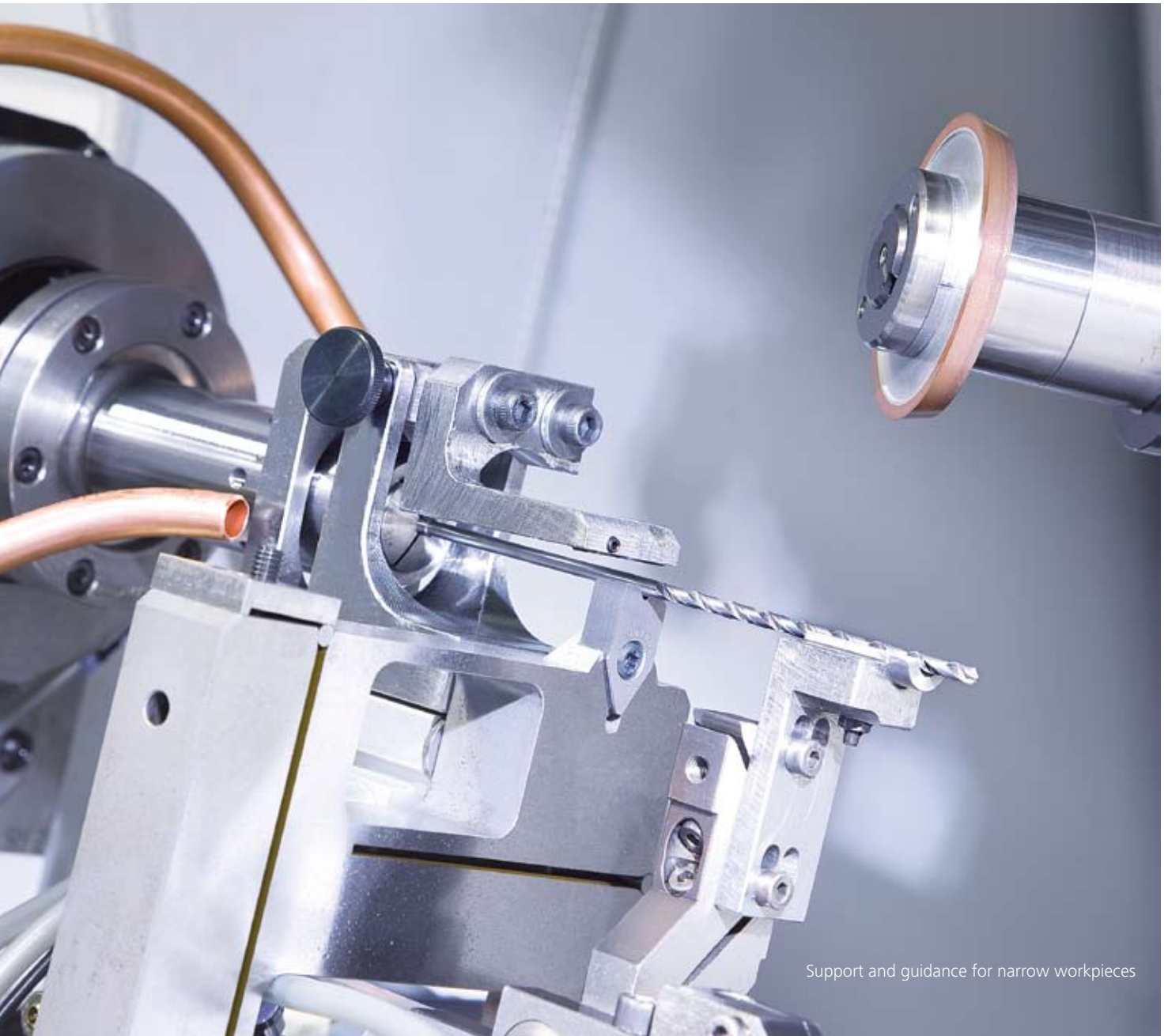
Dressing with drive from the workpiece axis



Swivelling probe for position determination and measurement of the workpieces



Additional probe for measuring the grinding wheels in the machine



Support and guidance for narrow workpieces

Option for increasing precision

When high precision is demanded, the 325linear can be equipped with additional options which can also be used in fully-automatic mode to achieve top accuracy.

After the workpiece has been clamped, the permanently present workpiece probe determines the exact position and orientation of the workpiece. Thanks to a special probe tip, the position of cooling ducts can also be determined. As an option, a second measuring probe can be fitted on the workpiece axis with which, e.g. the diameter and the unclamped length of the grinding wheels in the machine can be measured fully automatically. This probe can also be used for thermal compensation. For this purpose, a reference ball installed at the spindle housing is probed at adjustable intervals. The determined probing results are forwarded to the control system as axis corrections.

The grinding wheels can be dressed in the machine at intervals of your choice. Stationary and rotating dressing tools can be used for this purpose. The rotating tools used may be diamond forming rollers and dressing rolls with conventional abrasives. The dressing roll can be installed either on the rotation axis or with its own spindle drive on the housing of the rotation axis. In addition, a first-cut and balancing sensor system can be implemented.

The machine measurement can be carried out fully automatically as an option. This guarantees high accuracy of repeatability of the results.



- Automatic recording of the workpiece position with the 3D measuring probe
- Special probing tip for cooling ducts
- Dressing the grinding wheels in the machine
- Measuring the grinding wheels in the machine
- Automatic machine measurement

High accuracy of repeatability of the machine measurement through fully automatic cycle

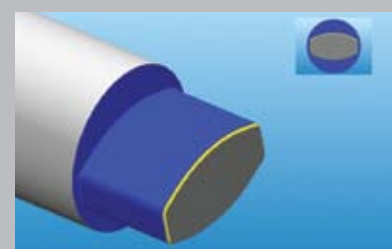
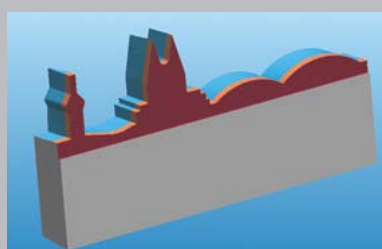
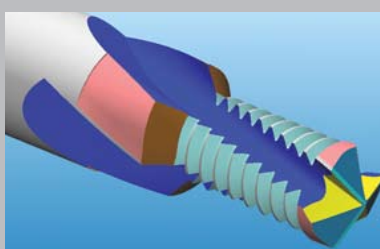
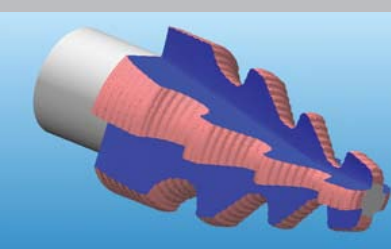
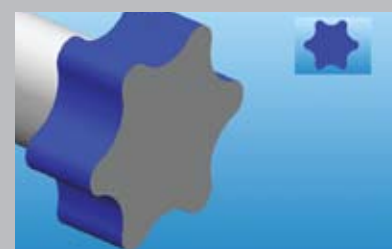
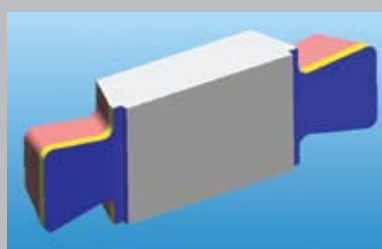
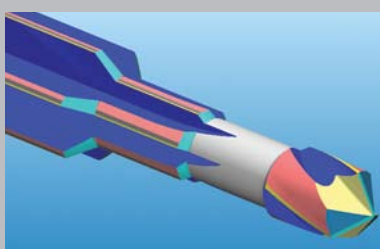
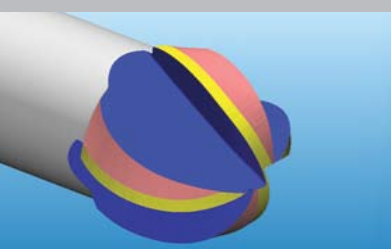
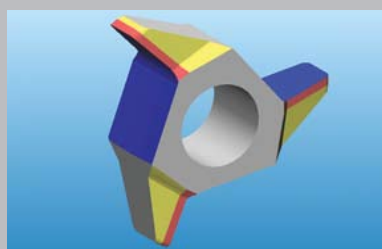
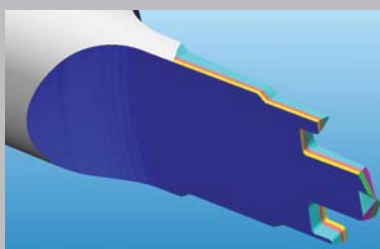
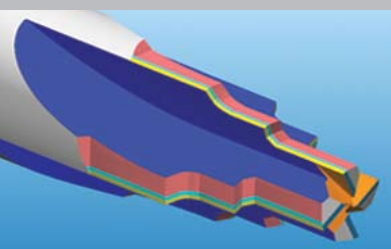
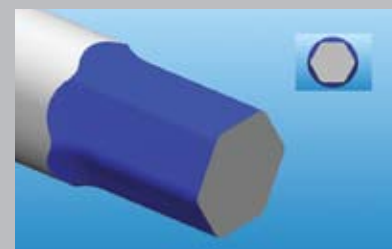
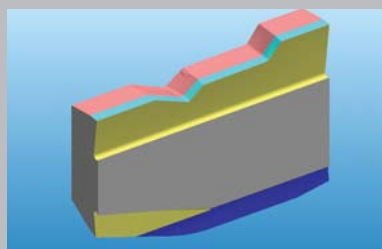
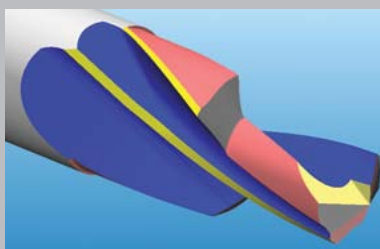
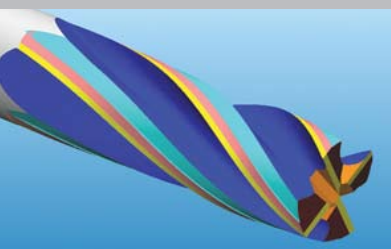
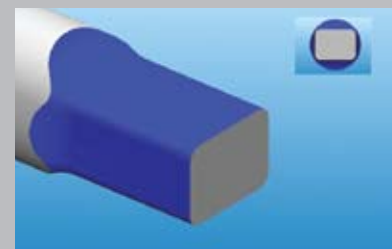
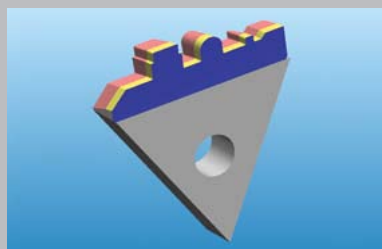
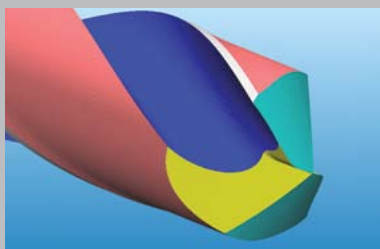
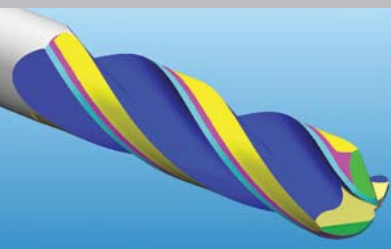
PRECISION MEANS LEAVING NOTHING TO CHANCE

Milling cutters

Drilling tools

Profile plates

Profile punches



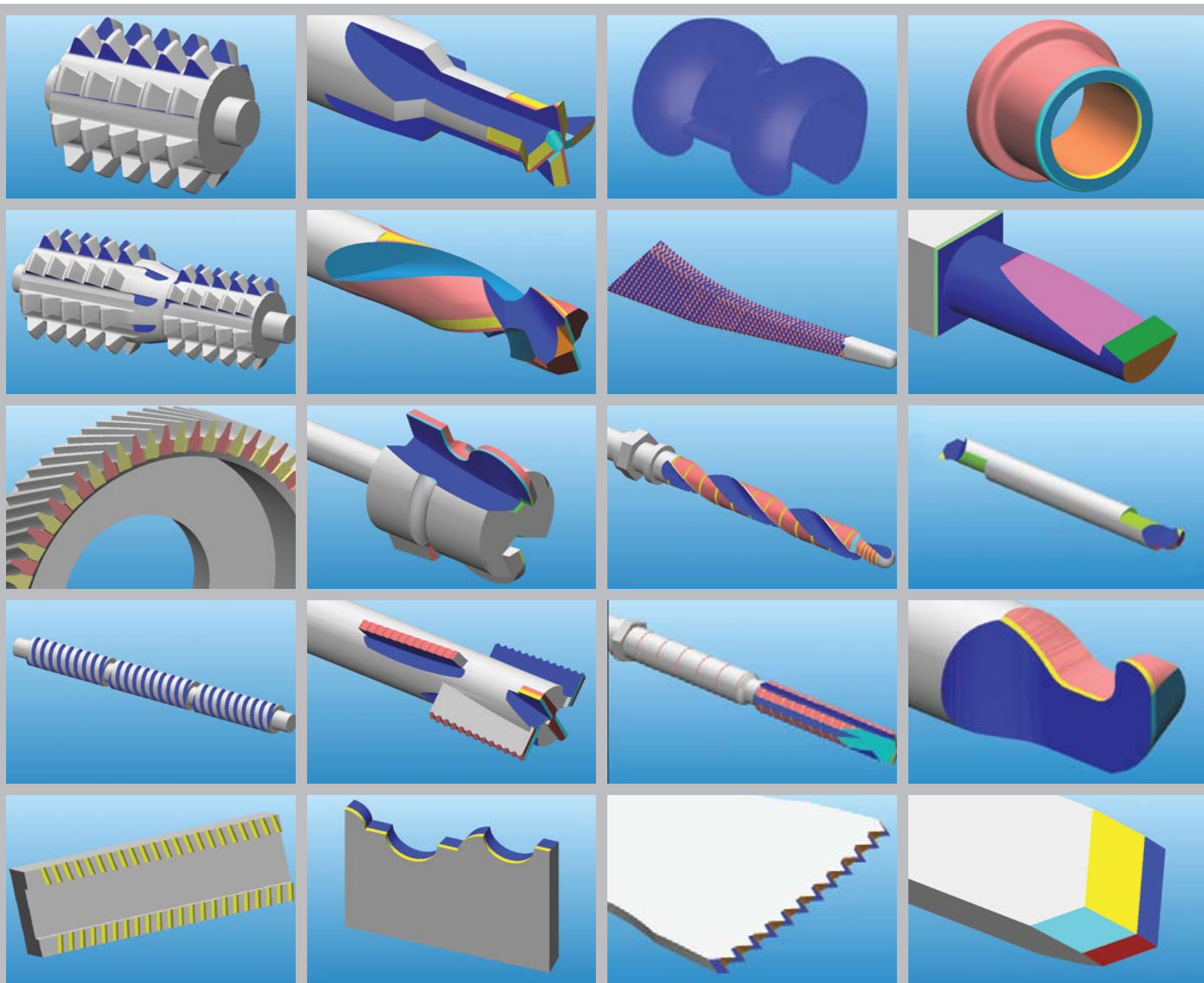
Unlimited possibilities

Toothed tools

Woodworking tools

Medicinal requirements

Special applications



THE 325LINEAR AND SIGSPRO – A STRONG TEAM

Expansion stages of the grinding wheel magazine:
left: 12 positions (option)
right: 24 positions (option)
bottom: 5 positions (standard)



Scalable grinding wheel changers

Productivity benefits are not only achieved through efficient grinding processes but also through a high degree of automation. This makes flexible concepts necessary, e.g. an automatic grinding wheel change for unmanned production. Schütte provides innovative and made-to-measure solutions for this purpose.

The automatic grinding wheel change is carried out with machine axes that are used to exactly approach the transfer position. An HSK interface in the spindle guarantees positioning of the grinding wheel to μ -accuracy.

The coolant distributors are changed together with the grinding wheels. Every process thus has the optimum coolant supply even after the automatic change. An extensive range of grinding wheels is provided from the magazines. Abrasive wheel holders are available for a very large range of bores. Different expansion stages provide almost unlimited flexibility: selection of between 5, 12 or 24 grinding wheel positions is possible.

The basic configuration of the 325linear already contains a 5-fold grinding wheel magazine integrated in the installation space. As an option, a magazine with 12 or 24 positions can be used, with which the next wheel set is provided parallel to the process in the fast-acting 2-fold changer.



- 5-fold grinding wheel magazine in the basic configuration
- Optional 12 or 24-fold grinding wheel magazine
- Grinding wheel change with associated cooling lubricant distributors

WHEEL SETS AVAILABLE ON CALL



Pallet magazine



Swivellable gripper for pallet or chain magazine



Chain magazine



Loading with robot in conjunction with external pallet magazine

Made-to-measure automation

The automation solutions of the 325linear allow you to produce workpiece geometries efficiently and flexibly from a batch size of one up to highly optimised bulk production. For this purpose, the 325linear is automated as an individual cell and can thus operate profitably in unmanned shifts or can be interlinked in production systems.

Depending on the workpiece and batch size, different handling systems are available with the 325linear. This means that everything is possible from manual loading via a pick-up system with pallet or chain magazine to the completely flexible robot cell.

Standard workpiece loading and unloading is by means of a pneumatically actuated swivel arm. If this is equipped with a double gripper, both procedures can be carried out directly one after the other. The swivel arm is a pick-up solution integrated in the installation space, which can be combined with pallets of varying capacity (max. 400 pallet positions) or a chain magazine (max. 140 workpieces).

As an alternative to the pick-up system, the chuck of the workpiece rotation axis can also be filled directly by a robot. The robot cell offers considerably higher capacities and possibilities for additional activities such as reversing, measuring, ejecting and others. Depending on the flexibility requirements, the software supports a diameter-dependent bundling of the workpiece supply and purely order-based processing.

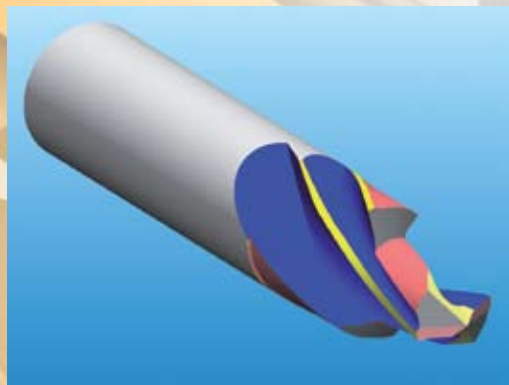
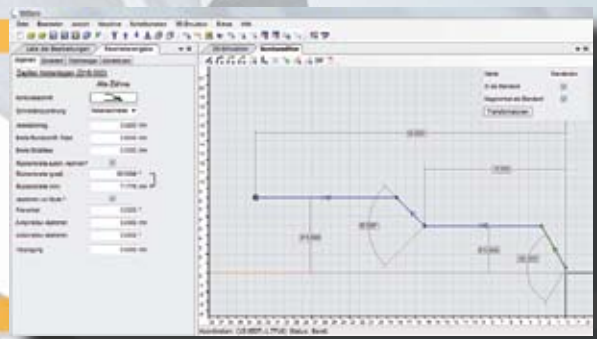
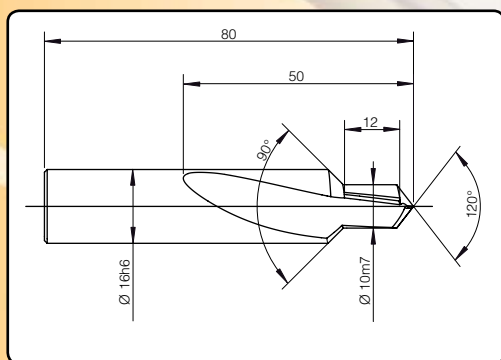
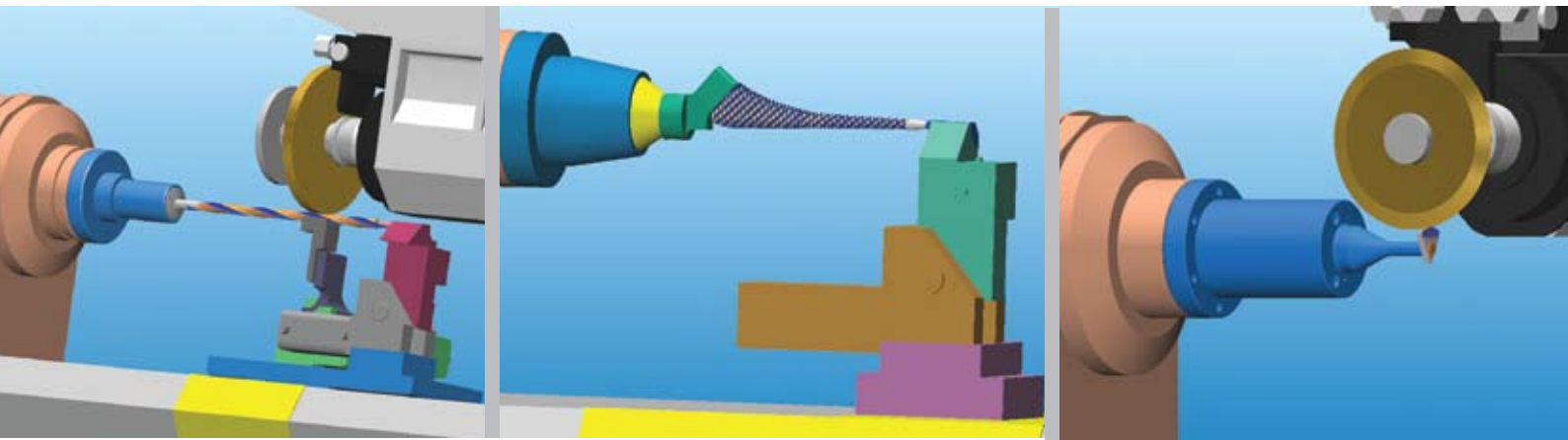
Mixed-mode operation is also possible. Our gripper solutions change every workpiece shape safely and precisely.



- Scalable automation: Pick-up with pallet or chain magazine, robot
- Precise, safe gripping technology
- Fast change cycles
- Capacity optimised to one shank or diameter flexibility

View in the robot cell

MAKE MONEY WHILE YOU SLEEP



SIGSpro – appealingly simple

Simple operation and programming is possible even for complex kinematic sequences. Schütte demonstrates this with its convenient, in-house-developed operation and processing interface SIGSpro (Schütte Integrated Grinding Software).

When the software handles as many work steps as possible and makes input automatically, users quickly achieve their objective. Wizards are integrated in the software for this purpose. On the basis of a few queries, they create the required grinding operation, assign suitable grinding wheels and preassign all geometry and technology parameters in a practical manner.

To guarantee the highest level of flexibility, **SIGSpro** allows you to freely combine the grinding operations and to use them as often as you wish in a production sequence. There are no limitations due to preset tool types. Furthermore, during the entire process **SIGSpro** is able to generate separate NC subprograms for the individual teeth of the workpiece. This allows grinding operations to be activated or deactivated without any problems on a tooth-to-tooth basis or to be assigned tooth-specific parameters. Furthermore, many parameters along the cutting edge can be varied.

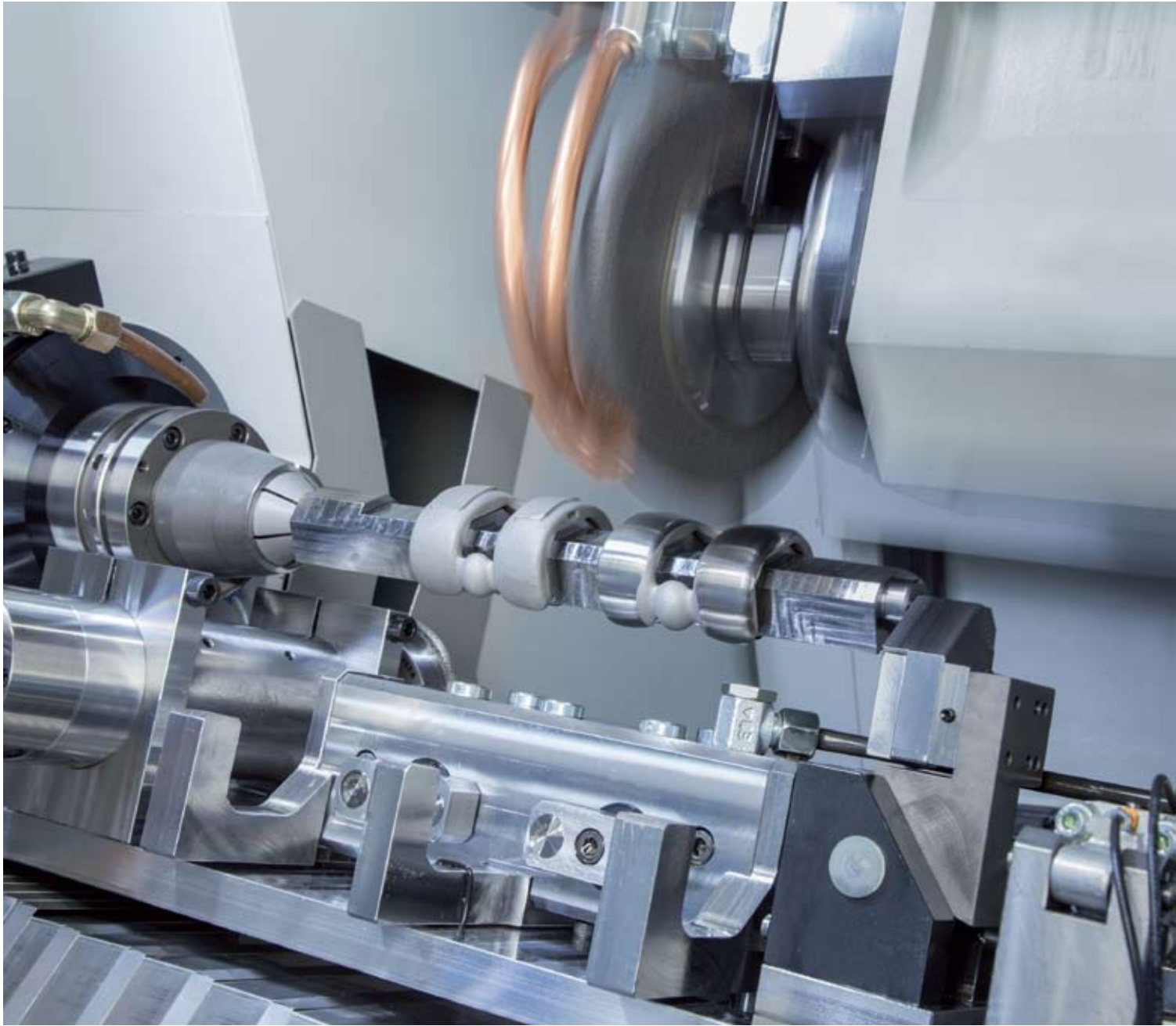
A closed surface model of the workpiece is generated in the 3D simulation. The viewing angle can be changed and you can zoom into the smallest details without any problems and with no loss of quality. A series of innovative functions are introduced for further convenience: For example, the rotational solid of a drill bit can be calculated, drawn and compared with the target contour.

Before production at the machine starts, the entire sequence can be checked for the possibility of collisions. In particular, moving machine parts, such as the support or tool guidance system, can be included in the analysis.

- Comprehensive, convenient and user-friendly control system interface
- Simple to learn with intuitive, Windows-oriented menu navigation
- Integrated 3D simulation
- Efficient measuring and analysis functions
- Machining area simulation based on realistic 3D models
- Automatic collision monitoring



GRINDING HAS NEVER BEEN EASIER



Innovative medicinal applications

The medicinal products constitute an important element of medical technology. Due to a constantly increasing life expectancy and the demand for a high quality of life in old age, medical technology is enjoying an increasing economic interest. Because of strict contour accuracy and surface quality requirements, grinding operations on many technical medical products are necessary.

Schütte provides ready-made solutions for the production of a large number of medicinal products:

- Surgical instruments (e.g. knives, saws, bone drills, reamers and rasps)
- Cannulae
- Implants (e.g. hip, knee or shoulder implants)



The production process for these products, some of which are extremely complex, often involves several machining operations. The 325linear makes it possible to implement cost-effective complete production on a single machine tool. Integration and shortening of the complete process chain in production results in a considerable potential for savings and optimisation. The omission of reclamping operations also improves accuracy. An example of this is the complete machining of the femur components of a knee joint implant on the tool grinding machine 325linear in a single clamping system. This involves pre- and finish-grinding, which can be followed by cutting with end mills and spherical cutters and multi-stage abrasive belt grinding and polishing.

The use of grinding wheels that can be dressed and balanced means that high surface quality is already reached after grinding. Subsequent fine machining achieves high-gloss surfaces with Ra values of below 0.05 µm – starting with a cast blank.



- Solutions for a large number of instruments and implants
- Productivity benefits through complete production
- Precision thanks to omission of reclamping operations
- Grinding wheels that can be dressed and balanced for high surface quality
- Fully automatic order handling with 50- or 140-fold chain loader and 12- or 4-fold grinding wheel magazine

OPEN DOORS TO NEW MARKETS

Machine

325linear

Linear axes

Stroke:

X-axis (longitudinal movements)	mm	480
Y-axis (transverse movement)	mm	250
Z-axis (vertical movement)	mm	260

Resolution:

X-, Y- and Z-axis	µm	< 0.1
max. feed speed		
Y- and Z-axis	m/mm	24
X-axis	m/min	48

Rotation axis for workpiece (A-axis)

Resolution in dividing mode	degrees	< 0.0001
max. speed range as rotation axis	min ⁻¹	200
max. speed range as universal rotation axis	min ⁻¹	2500
Support taper		SK 50
max. torque	Nm	88

Swivelling axis for grinding head (C-axis)

Swivelling range	degrees	225
Resolution	degrees	< 0.0001
max. swivelling speed	degrees/s	360

Grinding spindle (motor spindle)

max. speed	min ⁻¹	12000
max. drive output	kW	15
Support taper		HSK-E 50

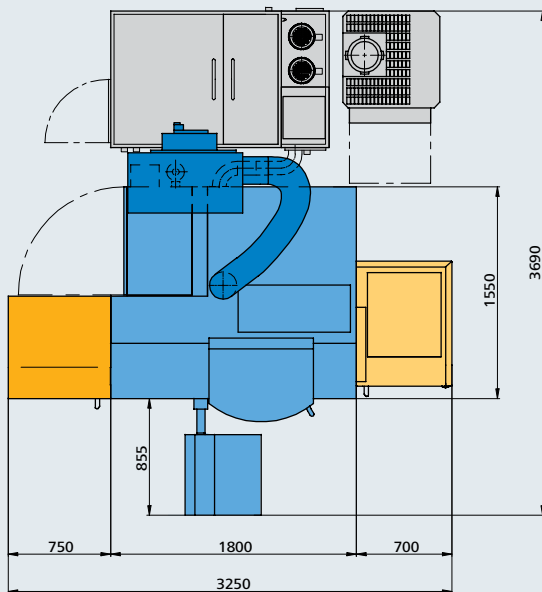
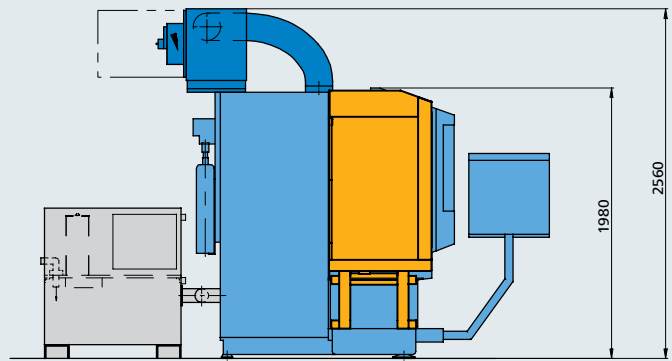
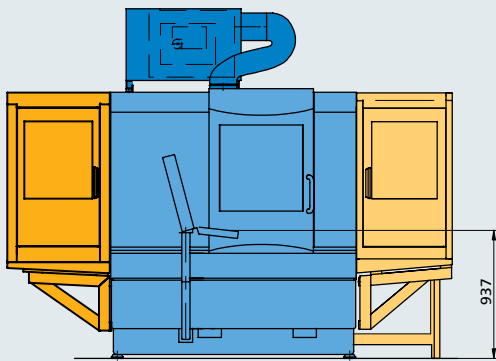
Grinding spindle option (among others, grinding points)

max. speed	min ⁻¹	24000
max. drive output	kW	8
Support taper		HSK-E 50

Control system

CNC	SIEMENS	SINUMERIK 840D sl
Drive technology	SIMODRIVE	SINAMICS S 120

Technical data



- Grinding centre based on the 325linear
- with 12-fold grinding wheel changer and
- 140-fold chain magazine,
- set-up solution with filter system, oil cooler,
- extraction system



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SERIES 325

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