



**Schütte Integrated
Grinding Software**

Technical Description

CNC GRINDING WITH THE 305 AND 325 SERIES

The SIGSpro software programs are based on workpiece, grinding wheel and technology data entered at the integrated PC and are used to generate CNC programs, which are transmitted via the bus connection to the machine control system, where they are worked through.

The input of workpiece- and grinding wheel-related data is supported by graphics. The data is saved on the hard disk as XML files. All Windows functions can be used for managing and archiving these files.

A one-time machine measurement must be carried out during machine installation. The start-up positions and safety positions of the grinding wheels are calculated by the program.

The positioning of the workpieces in the machine is by means of measuring probes. For this purpose, the CNC programs calculated by the PC contain a program part, which fully automatically determines the setting length and, if necessary, the circular position of the workpiece. Specific workpiece data can also be measured with the measuring probe as an option.

Application areas for the respective parameters are defined in the framework of this input. These specifications describe within which limits program testing is carried out at Schütte. Furthermore, in many cases tools can also be processed beyond the specified limits without any problems (e.g. smaller / larger diameters, larger helix angles). Users can also extend the application range of the software by changing the corresponding limit values. **However, Schütte Schleiftechnik GmbH then cannot guarantee the correct function of the software for such applications and shall assume no liability for any resultant damage.**

Due to the high complexity of many calculations, information or fault messages may be issued during generation of the grinding programs. These can be avoided by making minor changes to the input parameters. The calculations on which the programs are based partly assumed ideal conditions, e.g. a worn grinding wheel in the form of a radius. As these preconditions do not always exist exactly in practice, limitations in the accuracy of the workpiece geometries achieved may result.

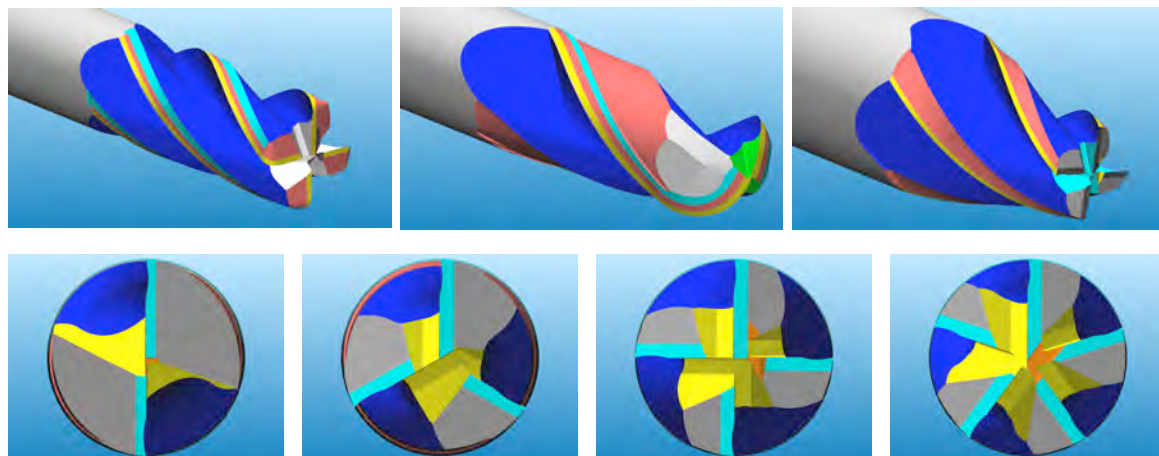
As an option, SIGSpro can be extended by the simulation module SIGS3d, which can be used to simulate the machining procedure. Apart from the options for displaying, measuring and analysing the programmed tools, collision monitoring is also included here. **Schütte Schleiftechnik cannot guarantee the effectiveness of this monitoring system and shall not be liable for any resultant damage.**

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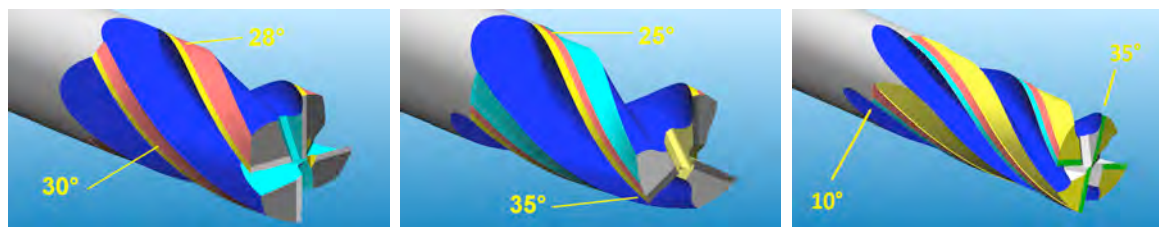
S100: Basic package for milling cutters

For microfibrils (face diameter < 1.5 mm), the optional pos. S820 is required



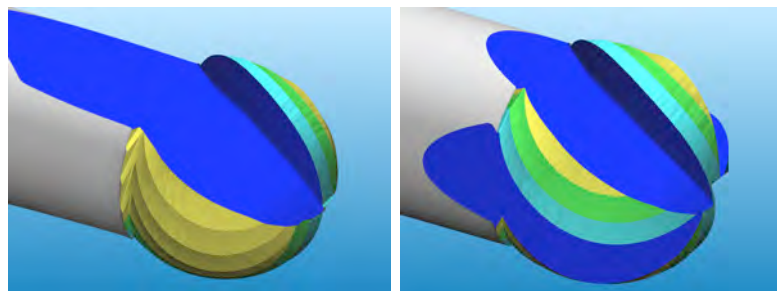
Prerequisite: Milling cutters basic package (pos. S100)

This function extension also allows the machining of milling cutters with variable helix. Helix angle and pitch can be assigned individually to every tooth. Furthermore, the helix can also be specified variably along the cutting edge. As an option, the total width of back for all teeth can be kept constant.



Prerequisite: Milling cutters basic package (pos. S100)

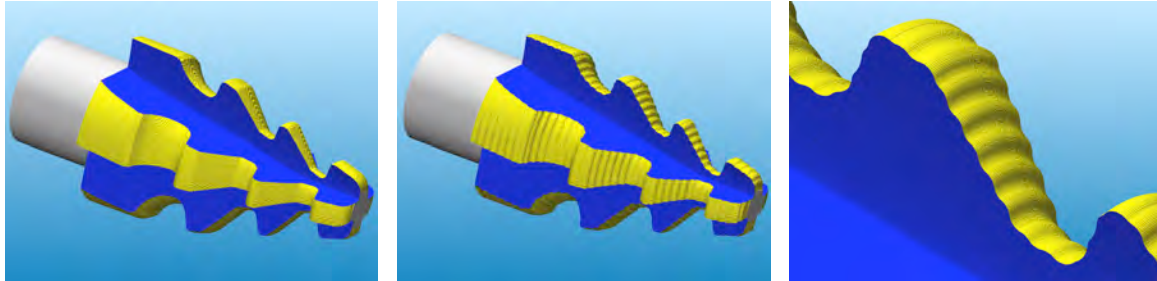
This extension package allows the production of ballnose milling cutters with an included angle of up to 300 degrees. It contains grinding operations for the rake surface and for up to three circumference clearance angles.



S140: Extension package for fir tree cutters

Prerequisite: Milling cutters basic package (pos. S100)

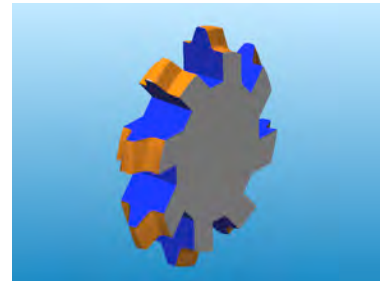
This extension package permits the production of fir tree cutters. Contour relief grinding can be land-shaped or linear. The relief grinding can be calculated such that even after repeated regrinding of the rake surface the specified contour is retained (logarithmical relief grinding). With the "roughing cutter" version, a corrugated profile can be superimposed to which a separate starting point can be assigned on every cutting edge.



S150: Extension package for form cutters

Prerequisite: Milling cutters basic package (pos. S100)

This extension package permits the production of form cutters. Contour relief grinding can be land-shaped or linear. The relief grinding can be calculated such that even after repeated regrinding of the rake surface the specified contour is retained (logarithmical relief grinding).



S160: Extension package for disk mills

Prerequisite: Milling cutters basic package (pos. S100)

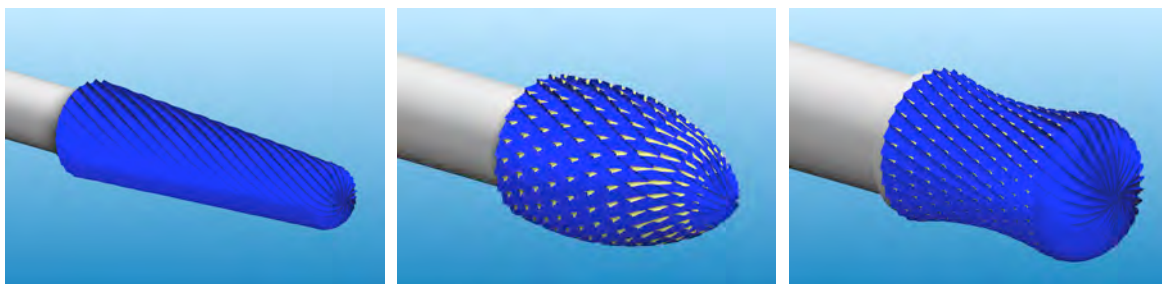
This function extension permits the production or resharpener of straight- or cross-toothed disk mills. The disk mills can be straight, with chamfer or with corner radius.



S170: Extension package for rotary cutters

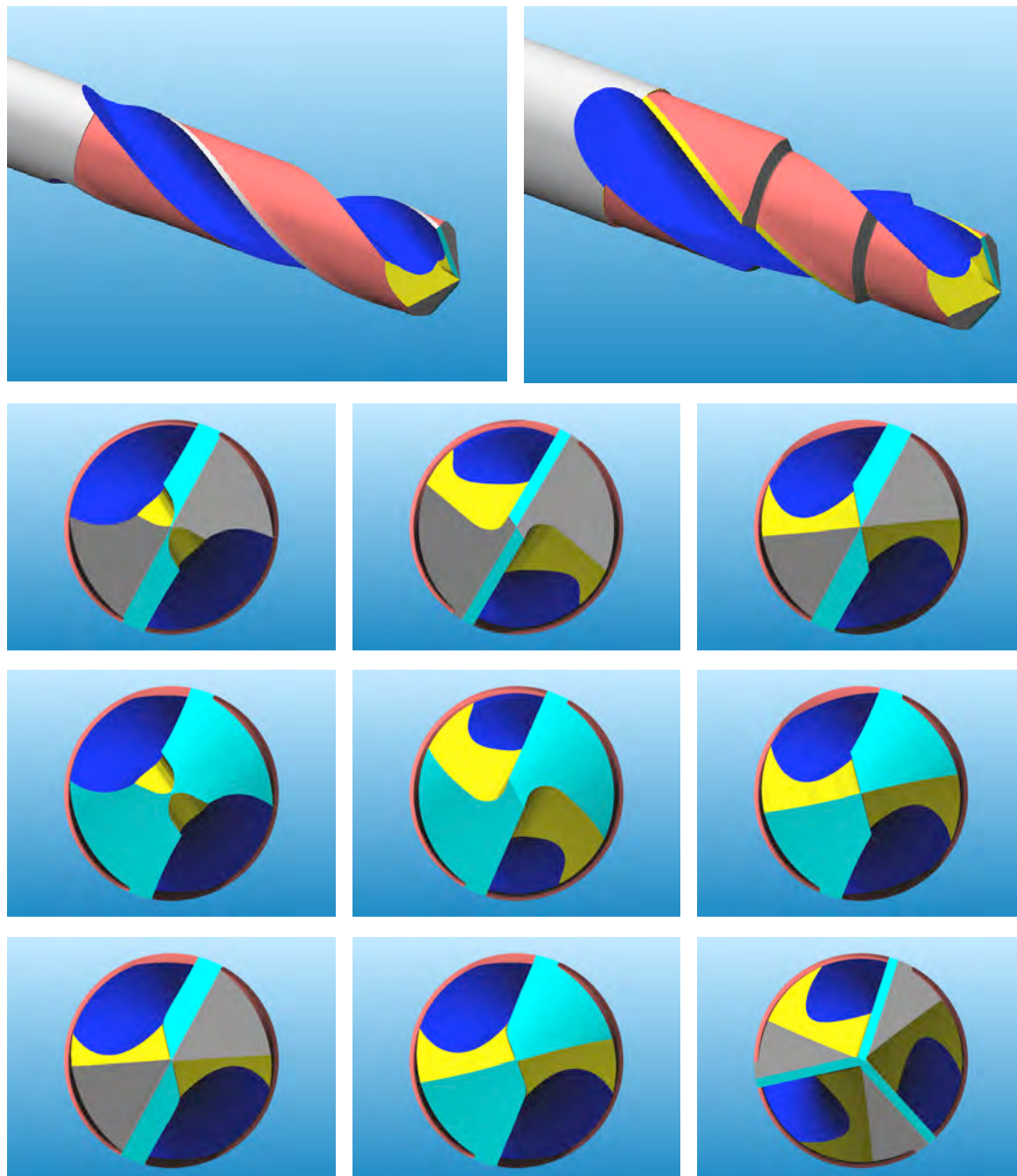
Prerequisite: Milling cutters basic package (pos. S100)

This extension package allows the production of rotary cutters with parameterizable field toothing in the centre. For the peripheral contour, you can select between the basic shapes sphere, oval, flame, tip radius and sugarloaf. Furthermore, it is also possible to define the peripheral contour user-specifically in the Contour Editor. The package includes grinding operations for the chip flutes and chip breakers.



S200: Basic package for drilling tools

The basic package can be extended by additional options for cylindrical grinding (pos. S300) or for complex flute shapes (pos. S320). The extension packages S330 and S340 contain further operations (land grinding, line-by-line milling) for contouring. Manufacturer-specific drill starting cuts are offered under positions S210, S215 and S216. For microdrills (face diameter < 1.5 mm), pos. S360 is required

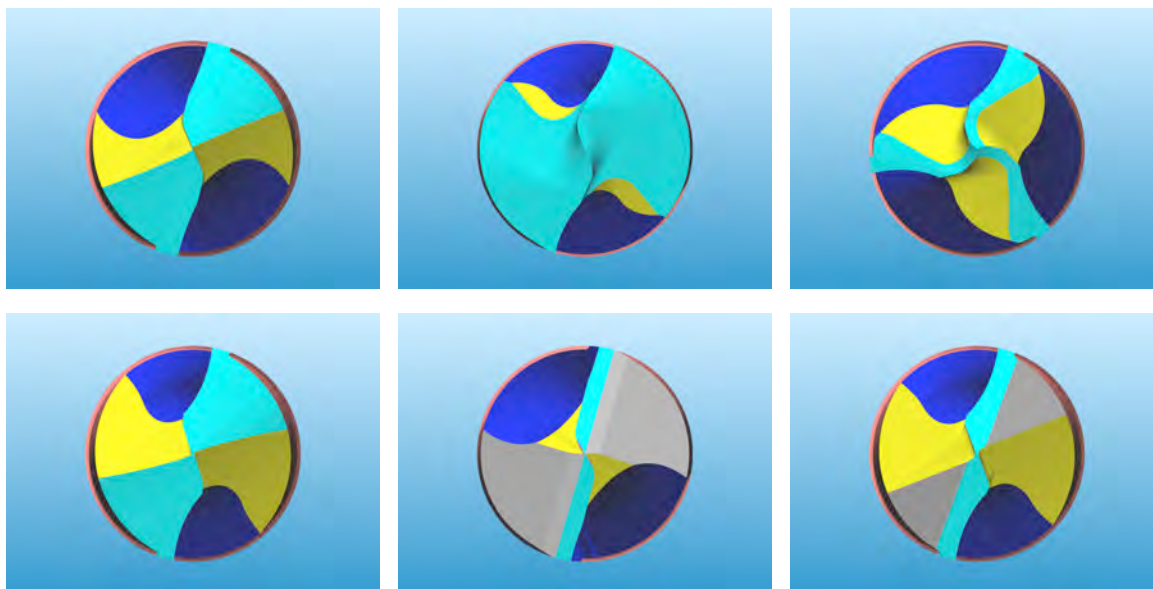


S210: Extension package manufacture-specific drill starting cuts

Prerequisite: Drilling tools basic package (pos. S200)

This extension package allows the production and regrinding of the following manufacturer-specific cuts:

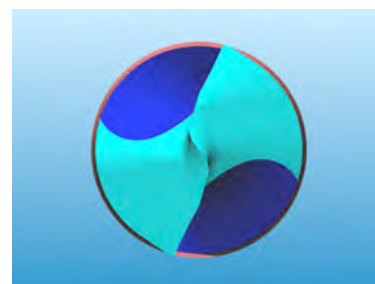
- Drill starting cut similar to Sumitomo Multidrill, Gühring S or Klenk Wega
- Drill starting cut Hertel SE
- Drill starting cut Hertel TF
- Drill starting cut similar to Seco SD10, SD20, SD25, SD30, SD35
- Drill starting cut similar to Sandvik DELTA C R415.5, DELTA R411.5
- Drill starting cut similar to Titex Alpha II



S215: Extension package drill starting cut Hertel HP

Prerequisite: Drilling tools basic package (pos. S200)

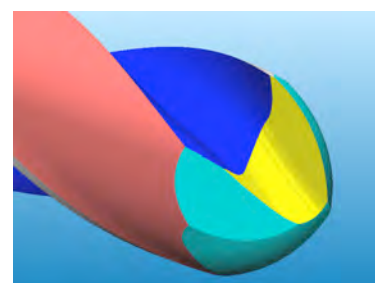
This extension package permits the regrinding of drill bits of type Hertel HP. An additional contract with Kennametal is required.



S216: Extension package drill starting cut Gühring RT 100

Prerequisite: Drilling tools basic package (pos. S200)

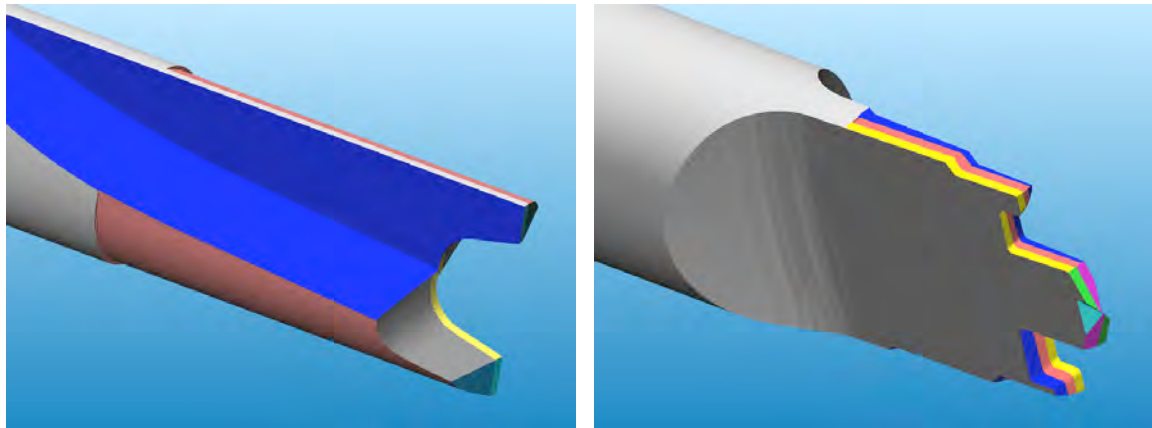
This extension package permits the regrinding of drill bits of type Gühring RT 100. An additional contract with Gühring is required.



S230: Extension package for contouring end face / shoulder contour

Prerequisite: Drilling tools basic package (pos. S200)

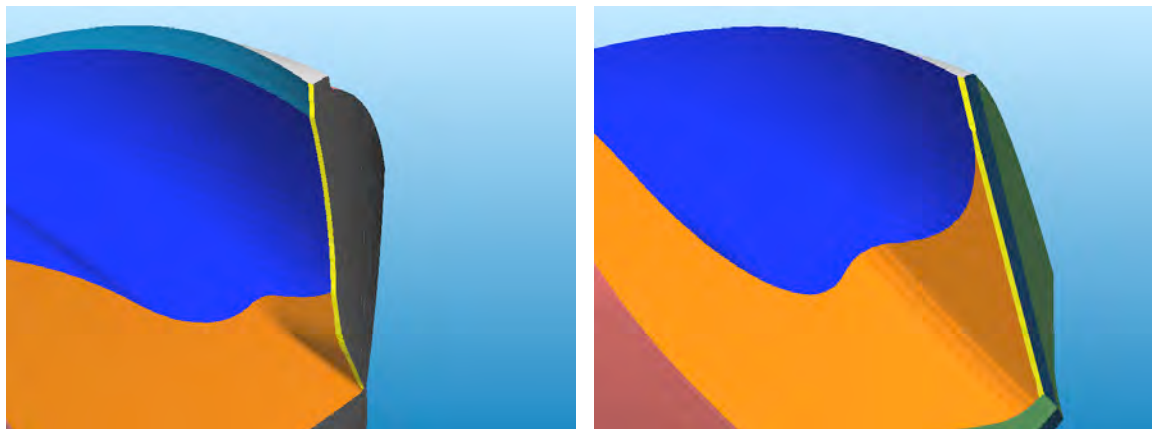
This extension package contains grinding operations for up to three clearance angles on face-cutting contours. The size and orientation of the clearance angles can be freely defined along the contour.



S240: Extension package for negative land at drill cutting edge

Prerequisite: Drilling tools basic package (pos. S200)

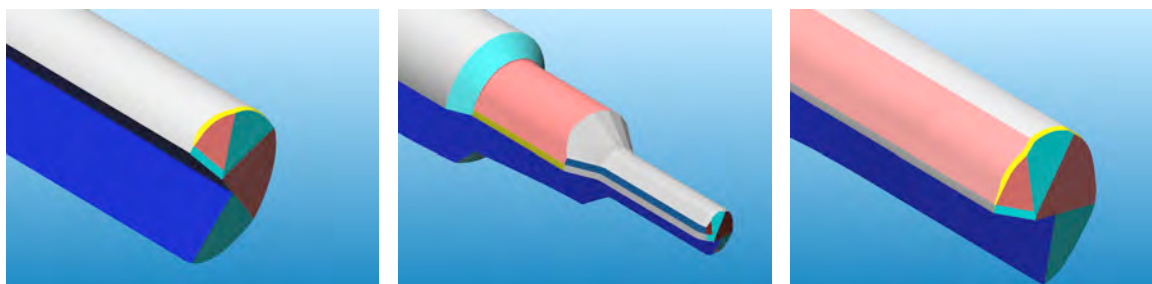
This option contains an additional grinding operation for producing drill bits with a negative land at the drill cutting edge (k land). It is designed for drill bits with circular thinning similar to Sumitomo Multidrill, Gühring S or Klenk Wega or with thinning shape B.



S250: Extension package for gun drill

Prerequisite: Drilling tools basic package (pos. S200)

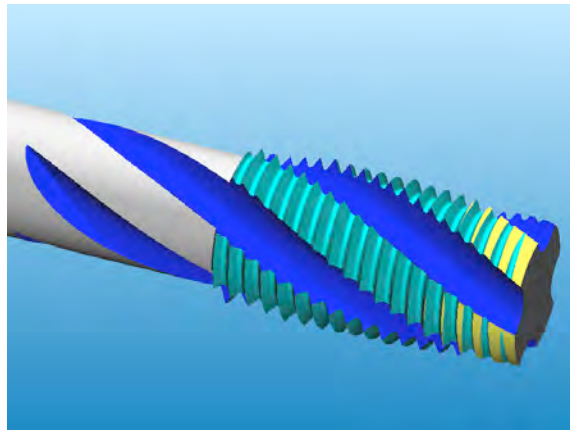
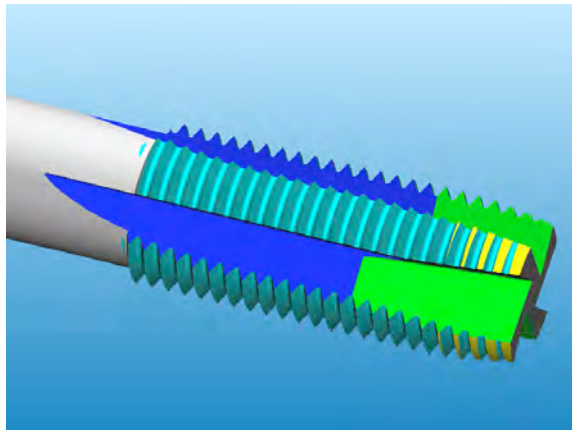
This extension package contains additional grinding operations required for gun drills. The drill bit can be ground with five or seven surfaces. The first cut can be realised with two clearance angles or as a circumferential chamfer. During production, up to three oil pockets can be created.



S260: Extension package for tapping tools

Prerequisite: Drilling tools basic package (pos. S200)

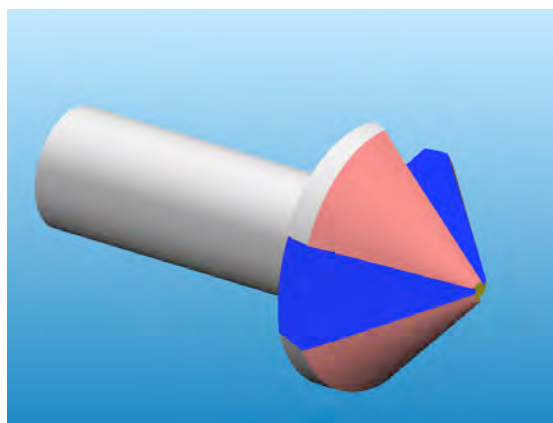
This extension package permits the production and regrinding of tapping tools. It contains grinding operations for the relief cut, point gashing and for the production of the thread.



S270: Extension package for countersinks

Prerequisite: Drilling tools basic package (pos. S200)

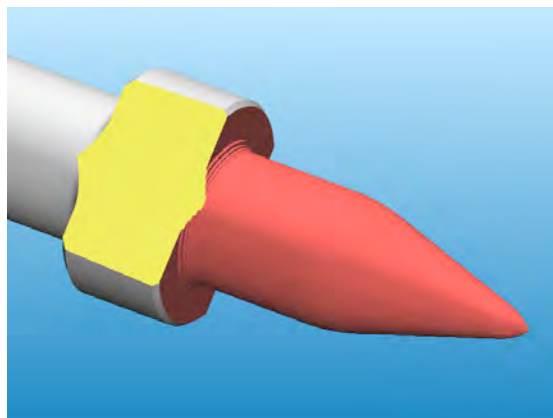
This function extension is used to produce and sharpen countersinks. Grinding operations for the countersink-specific chip flute and arc-type relief grinding on the taper are added to the basic package.



S280: Extension package for flow drills

Prerequisite: Drilling tools basic package (pos. S200)

This option permits the production of flow drills. The peripheral contour is programmed in the Wizard or in the Contour Editor. The parameters for the polygon shape are freely selectable.

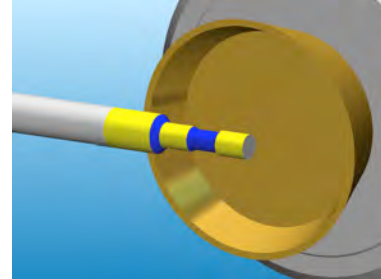


Extension for milling cutters and drilling tools

S300: Extension package for external cylindrical grinding

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

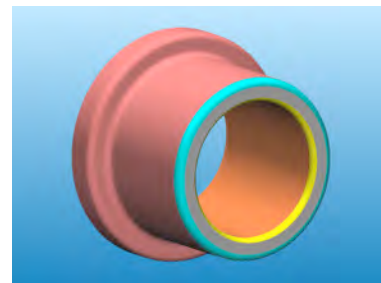
This extension package makes it possible to cylindrically grind the peripheral contour for milling cutters and drilling tools. Various grinding technologies are available for selection (side peel grinding, circumferential grinding, plunge cut roughing). The complete process can be divided into roughing and dressing cycles.



S310: Extension package for internal cylindrical grinding

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

This package extends SIGSpro by grinding operations for internal cylindrical grinding. These operations are usually carried out with grinding points and on production parts. Machining can either be carried out continuously or as a pendulum motion.

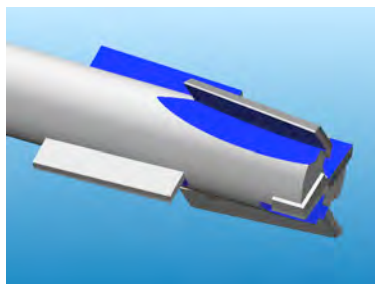
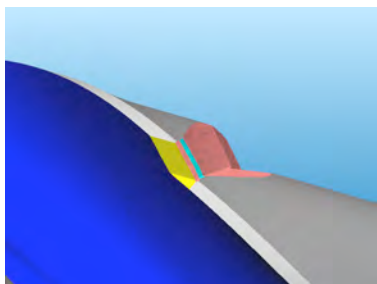
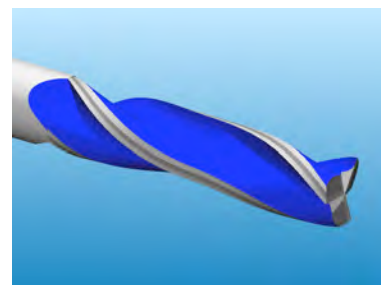
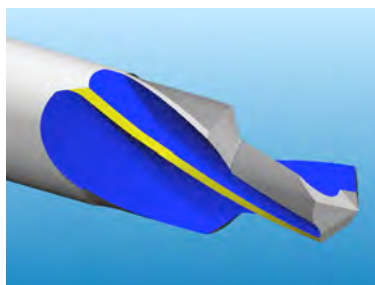


S320: Extension package for complex flute shapes

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

This extension package extends the basic packages by the following flute shapes:

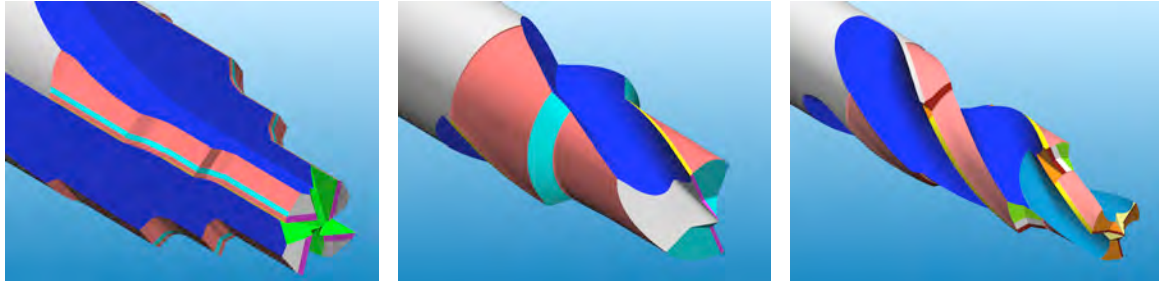
- Cylindrical multiple flutes: the flute parameters can be defined individually at up to three cylinders.
- Production of subland drills: operations for the main flute, additional flute and core bore.
- Flutes with variable helix: the flute parameters can be defined at freely adjustable control points.
- Chamfer at countersink cutters including indexing position adaptation for the relevant contour operations.
- Diagonal flutes, also suitable for tools with soldered-in tungsten carbide plates.



S330: Extension package for ascending peripheral contours

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

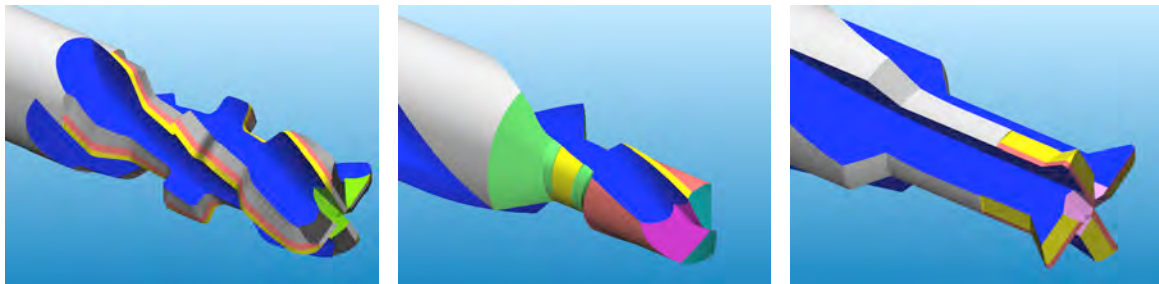
This package extends the basic packages by grinding operations at the peripheral contour of stepped tools, whose peripheral contour ascends from the face to the shank. In the area of the milling cutters, it permits the machining of stepped cutters and in the area of the drilling tools it offers additional machining options (land grinding, line-by-line milling) on the peripheral contour.



S340: Extension package for ascending and descending peripheral contours

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

This extension permits the grinding of the peripheral contour of profile tools whose peripheral contour has both ascending and descending contour segments.



S350: Extension package for combination tools

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

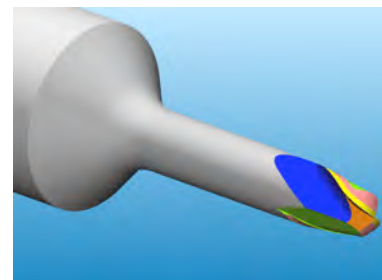
Combination tools in SIGSpro refer to tools that comprise at least two partial tools that are distinguished from one another by fundamental characteristics such as number of teeth or helix direction. Such tools can be produced or reground with this option.



S360: Extension package for microtools

Prerequisite: Basic package for milling cutters (pos. S100) or basic package for drilling tools (pos. S200)

The basic packages for milling cutters and drilling tools permit the machining of tools with a face diameter larger than 1.5 mm. For smaller diameters, the microtools extension package is required.

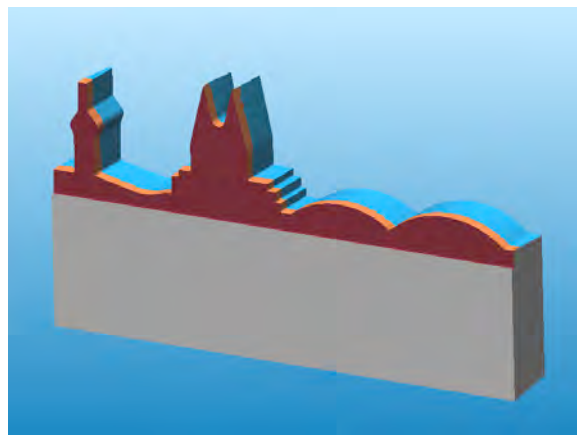
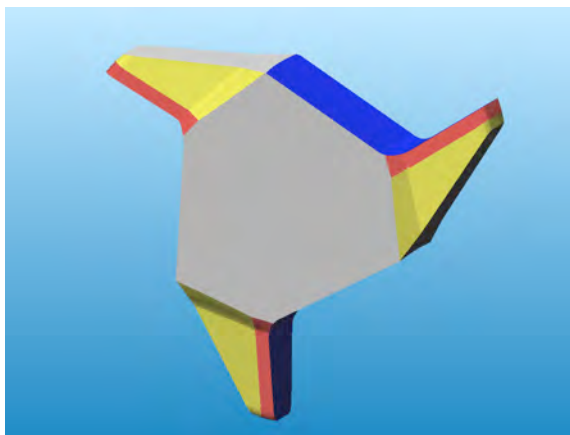
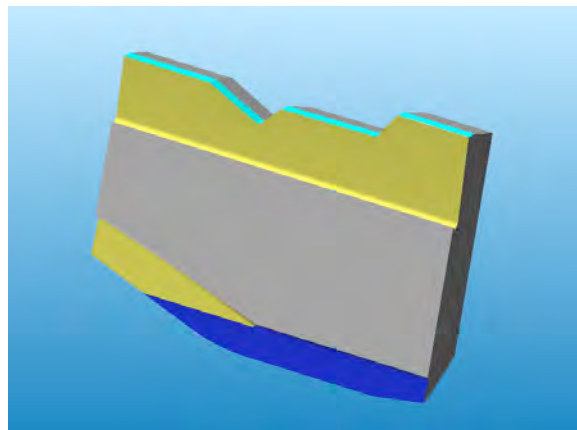
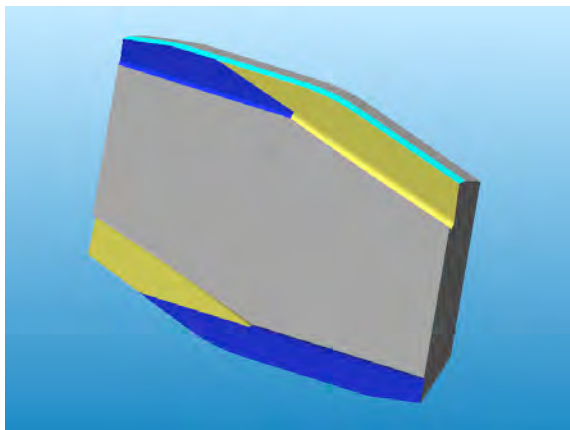
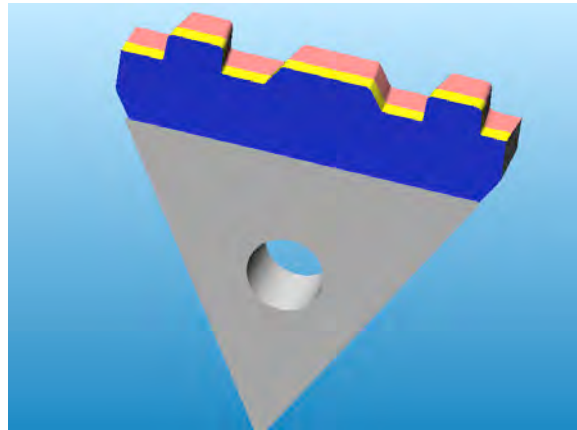
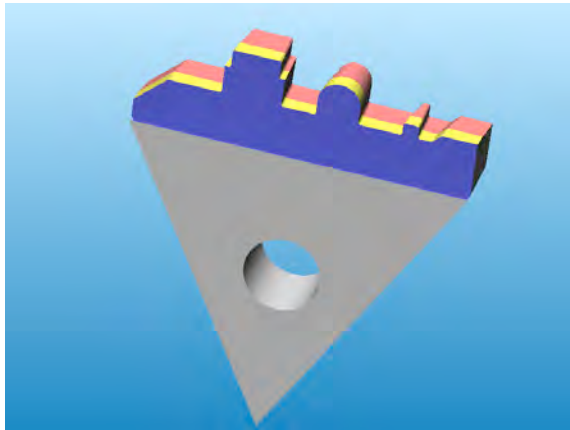


Profile plates

S400: Basic package for profile plates

This package makes production and resharpening of profile plates possible. The basic shape of the plate can be predefined (prism, rectangle, triangle) or can be freely defined via a contour. The software offers different options for clamping the plate in the machine, which can be freely configured. A special probing cycle determines the position of the plate in the machine.

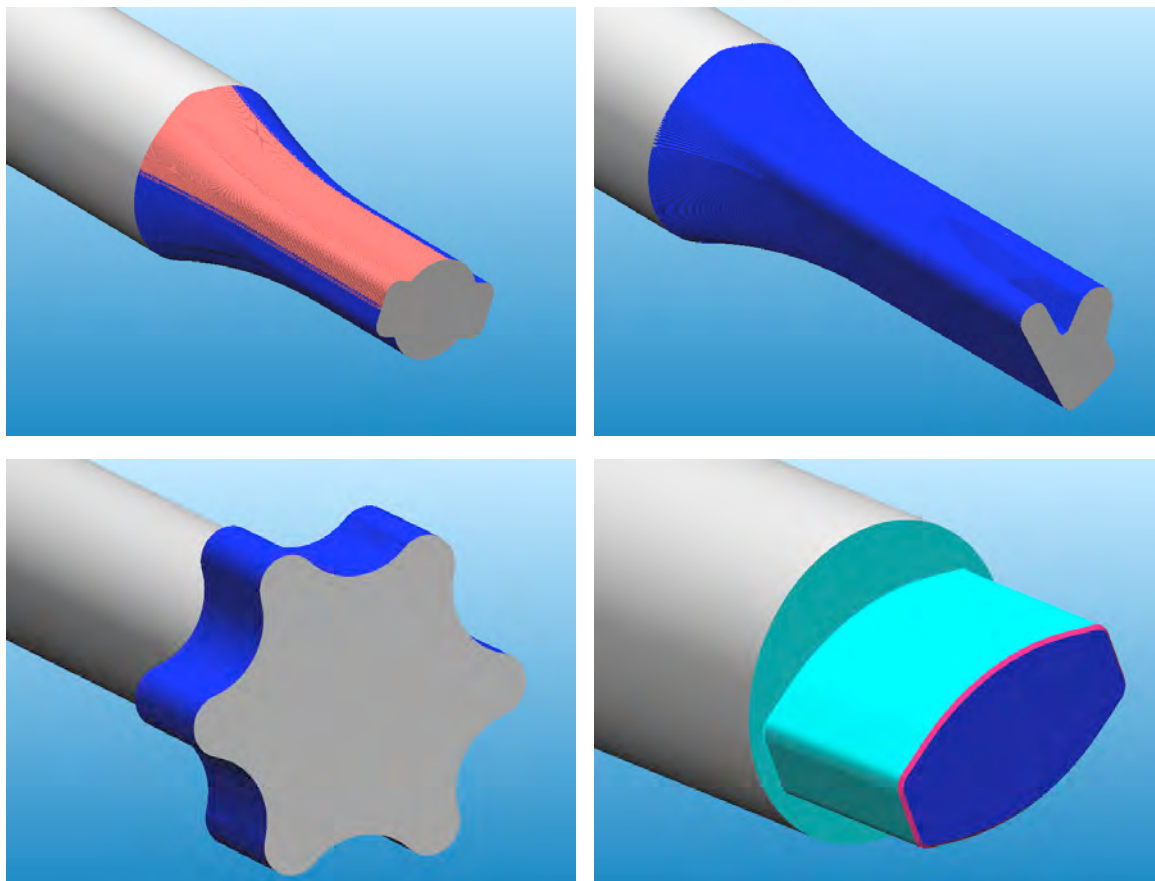
A large number of freely combinable grinding operations (rake surface, land grinding, reciprocal grinding) permit flexible production of all conventional plate types.



Punches

S450: Basic package for profile punches

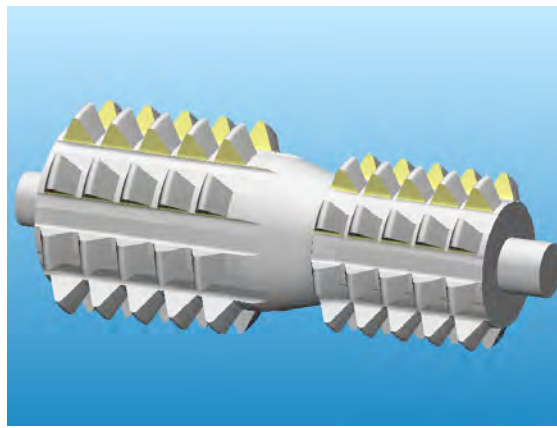
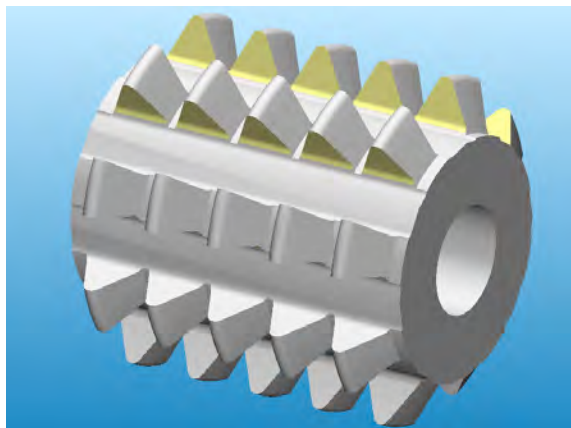
This option permits the production of profile punches. The punch profile is drawn in the Contour Editor or imported from a DXF file. Many punch shapes can be produced cost-effectively using the reciprocal grinding method. When doing this, the increment along the punch contour and the division into roughing and dressing cycles with individual machining allowances are freely selectable. As an alternative to reciprocal grinding, form grinding is offered whereby the grinding wheel can be positioned both parallel as well as perpendicular to the punch axis. The use of both grinding methods is freely combinable.



Gear cutting tools

S500: Basic package for straight-fluted cylindrical hobs

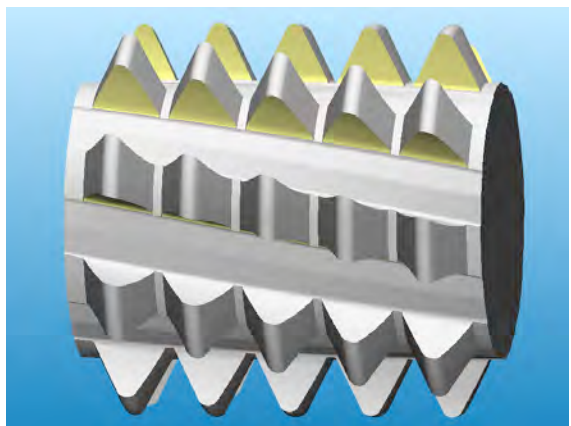
This package permits the regrinding of the rake surface of straight-fluted cylindrical hobs with straight dressed grinding wheel. One or two diameter steps are possible.



S505: Extension package for helical cylindrical hobs

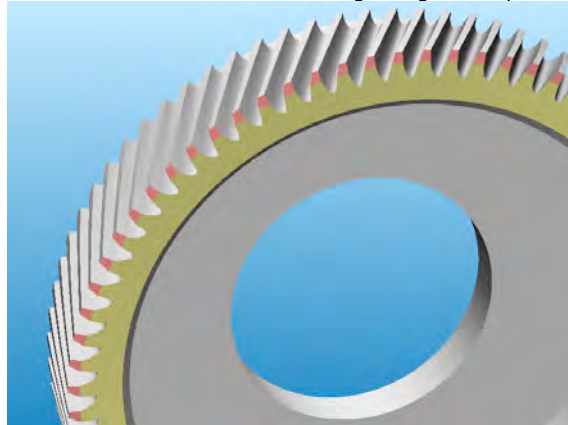
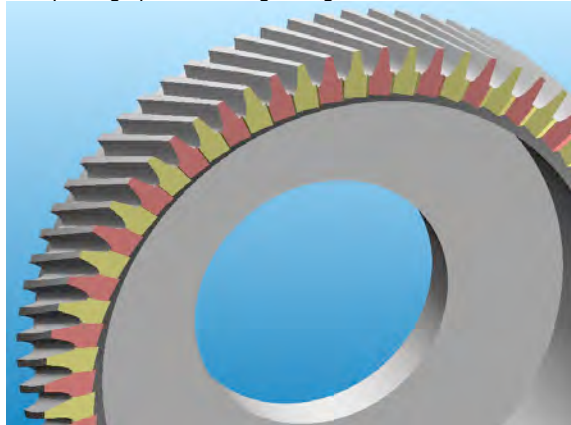
Prerequisite: basic package for straight-fluted cylindrical hobs (pos. P500)

This extension allows regrinding of the rake surface of single-step cylindrical helical hobs with straight or oval dressed grinding wheels. The profile of the grinding wheel must be specified by the user.



S530: Basic package for cutter wheels

This package permit the regrinding of the rake surface of cutter wheels either in the form of conical grinding or a step cut.



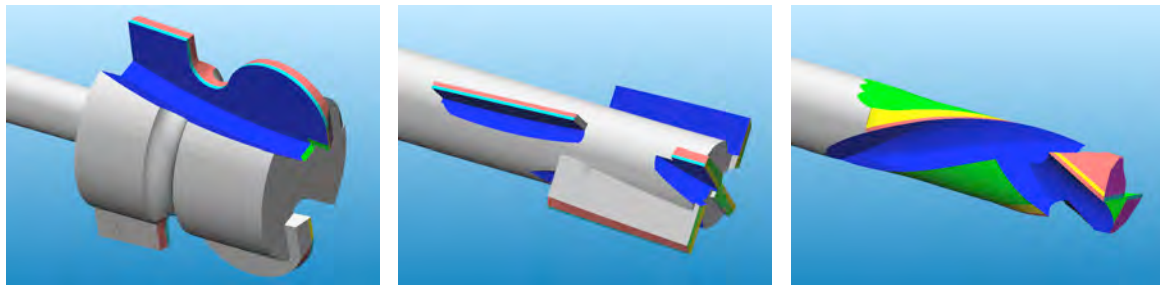
Woodworking tools

S550: Basic package for woodworking tools

This package allows the machining of typical woodworking tools.

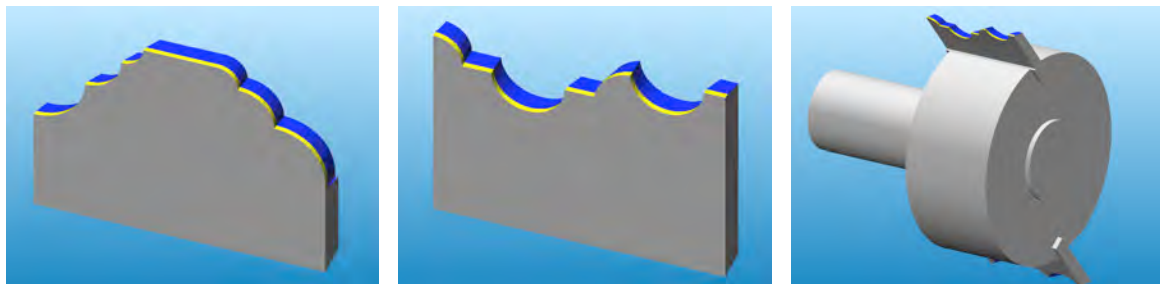
Profile cutters and routers with straight axis angle cutting edges can consist of several tooth groups (pushed against each other in X-direction) with different numbers of teeth. At each cutting edge, the axis angle and the rake angle can be measured with the measuring probe. The rake surface, face plunge cut and face front rake, peripheral contour and rear side surfaces can be ground.

Up-down cutters are composed of two cutting areas with opposed helix angles. All grinding operations from the milling cutters basic package are available from the cutting area on the face; the rake surface and circumference clearance angle are ground on the cutting area on the shank side.



S560: Basic package for profile cutters

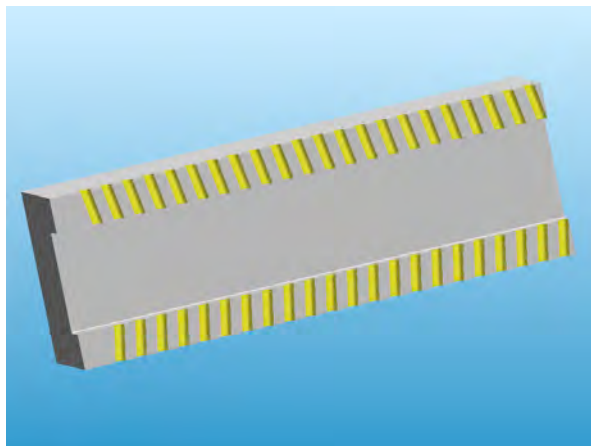
Up to three axial and radial clearance angles can be ground on profile cutters. The profile distortion caused by the clamping angle can be compensated as an option.



Broaching tools

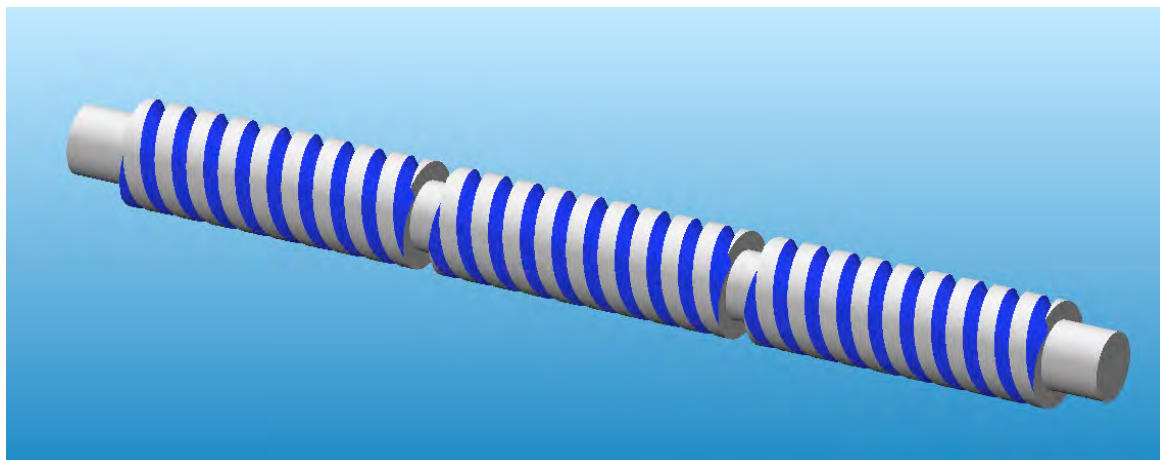
S600: Basic package for flat broaching tools

This program package makes it possible to sharpen flat broaching tools. It consists of a grinding operation for the rake surface and a probing cycle in which the position of the workpiece and the position of the first tooth are determined.



S610: Basic package for round broaching tools

This program package makes it possible to sharpen round broaching tools. It consists of a grinding operation for the rake surface and a probing cycle in which the setting length and start indexing position of the workpiece and, optionally, the helix lead are determined.



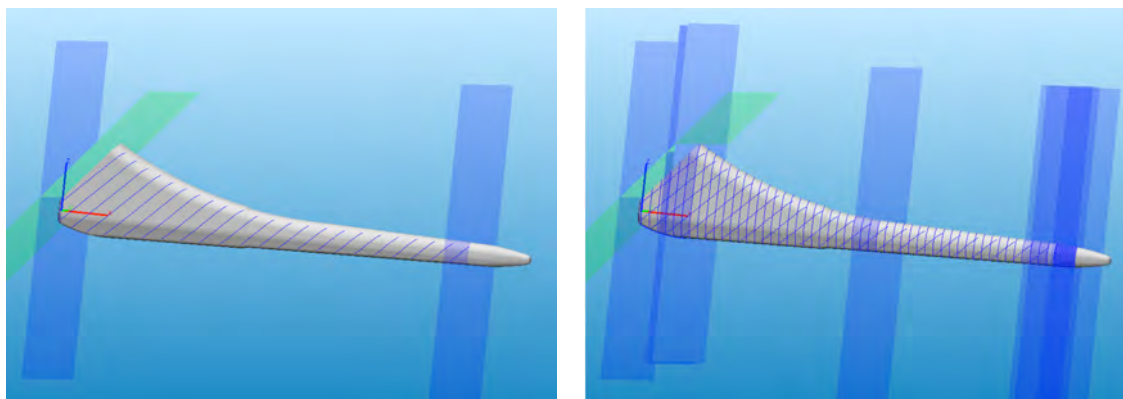
Medicinal tools and parts

Machining of medical rasps

The software for the production of medical rasps is divided into a workstation version and a machine version. The starting point for program preparation is a 3D model of the rasp base body in IGES format. At the external workstation, the teeth are defined in the form of cuts through the base body. Straight, diagonal and spiral teething forms are possible. The grinding paths are then calculated using this cut data and are implemented in NC programs. The result can be assessed with the help of the 3D simulation (see options S900 ff) and checked for collisions.

S650: Medical rasps, workstation version

This option permits the import of the IGES model, the definition of the toothing and the calculation of the grinding path with implementation in an NC program at an external workstation. The assessment in the 3D simulation is possible if the corresponding options are available.

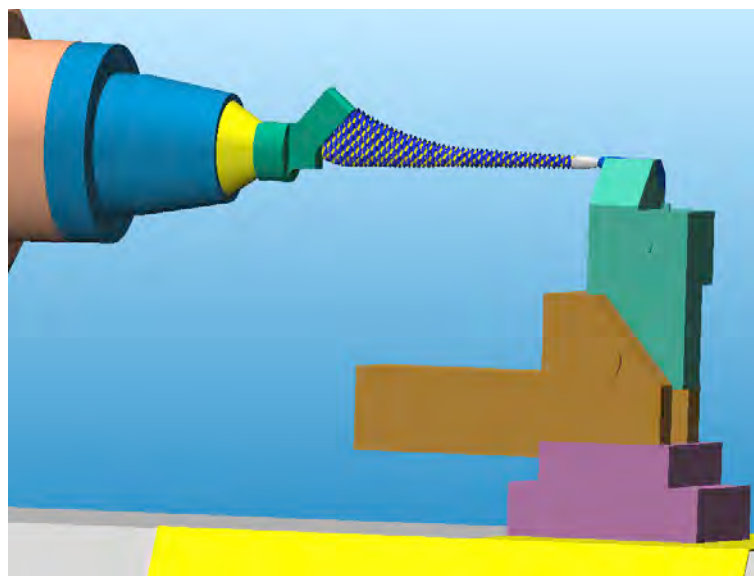


The licence is valid for one workstation, which is identified via the network address.

S660: Medical rasps, machine version

Prerequisite: medical rasps workstation version (pos. S650)

In the machine version, the toothing data that was defined at the external workstation is imported. This is used to calculate the grinding paths, which are then implemented in NC programs. The assessment in the 3D simulation and a check for collisions are possible if the corresponding options are available.



The licence is valid for one machine which is identified via its serial number.

Further options

S700: GDX interface

The GDX interface (Grinding Data Exchange) permits the data exchange between different software applications in the area of tool grinding. Workpiece data (parameters / contours), grinding wheel data, grinding paths, measurement instructions and measurement results can be saved in a GDX file. Option S700 allows the takeover of workpiece and grinding wheel data from a GDX file in the data format of SIGSpro. Further functions are contained in the options S710, S720 and S820.

The GDX interface will be defined by a task group under the umbrella of the VDI and will be published as a VDI guideline. Staff from Schütte are also active in this task group. This ensures that SIGSpro always contains the current range of functions of GDX.



S710: Interface to measuring machines

Prerequisite: GDX interface (pos. S700)

This functional extension can link SIGSpro with measuring machines (e.g. from Zoller or Walter Vialog) based on the GDX interface. When programming the specified contour in SIGSpro, users define the dimensioning including tolerances which are transferred as measurement instructions via the GDX interface to the measuring machine. These specifications are adopted by the measuring machine as a measurement program. Following the measurement, the measurement results are reported back as an actual contour via the GDX interface to SIGSpro. A target/actual comparison can be displayed there, whereby either the relevant grinding operations and/or wheels can be faded in. Based on this information, the user defines any necessary corrections for the next grinding operation.

S720: Interface to TD Sketcher (ISBE)

Prerequisite: GDX interface (pos. S700)

The TD Sketcher software from ISBE is used to prepare offer and production drawings by entering the tool parameters. This parameterisation can be transferred via the GDX interface to SIGSpro and implemented in a workpiece file. Conversely, it is also possible to export a workpiece description created in SIGSpro into a GDX file and to adopt it in the TD Sketcher and implement it in an offer or production drawing.



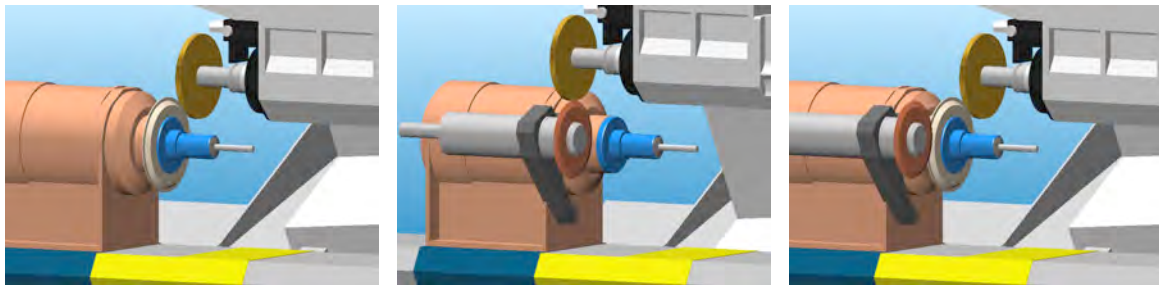
S730: Sending e-mails in the event of a fault

In the case of unsupervised production, it is often helpful if the machine can send a message to the responsible staff member in the event of a malfunction or when the production order has been successfully completed. This additional option can make this possible. The messages that are to be sent can also be configured.

Access to the Internet required for sending e-mails must be provided by the customer.

S740: Dressing grinding wheels

This option extends SIGSpro by the option for dressing grinding wheels. This is possible for grinding heads (11V9, 12V9), peripheral wheels (1A1, 1V1, 14EE1, 14F1) and profile wheels that are defined by a contour. The change in the grinding wheel parameters is adopted directly after the dressing procedure in the SIGSpro databases. Dressing can be inserted at any point in the machining list. It is also possible to use several dressing operations within the complete process. The dressing roll can be driven by the rotation axis or a separate dressing spindle. It is also possible to use two (different) dressing rolls. In this case, one will be driven by the rotation axis and one separately.



S750: SIGS iCut adaptive control

This option makes it possible to optimise grinding feed rates by evaluating the spindle load. The maximum spindle load can be specified individually for each grinding operation.

S790: Additional licence for use of the software on an external PC

The software options purchased with the machine are available on the machine's control computer. If SIGSpro is also to be used on a separate programming station, an additional licence is required. This means that all functions purchased with the machine are also available at the programming station. An exception to this is the 3D simulation, which is activated via a USB dongle either on the machine or at the programming station.

Custom-designed extensions

S800: Extension package for free grinding path

Many production parts cannot be machined without knowledge of NC programming. In this regard, it is an advantage that the standard operations of SIGSpro are freely combinable and can be used as often as desired in a project. In the case of work steps for which no suitable standard operations are available, the free grinding path can be used. For a free grinding path, the user first defines the active point on the grinding wheel and the positioning angle of the wheel in relation to the workpiece. The grinding path is then defined by a sequence of points in the workpiece co-ordinate system. A 2D graphic helps with the input. Paths with an extremely large number of points can also be imported from an Excel sheet. All functions of the 3D simulation for assessment of the grinding result are also available for free grinding paths.

S810: Extension package for free operations

With this option, the customer can extend the range of functions of the software by additional grinding operations for which he can define the input parameters and traverse movements of the machine himself. The customer fills the parameter page with entries in an Excel sheet. The traverse movements of the machine are defined in an NC subprogram. The entered parameter values are saved in the SIGSpro files. All functions of the 3D simulation for assessment of the grinding result and for collision monitoring are also available for free operations. Training courses can be offered upon request.

S820: Extension package for import of grinding paths via the GDX interface

Prerequisite: GDX interface (pos. S700)

This functional extension permits the importing of grinding paths via the GDX interface. The grinding paths are calculated by specially designed software and are written into a GDX file. They write the path of the grinding wheel centre point into workpiece co-ordinates. SIGSpro imports this data, calculates the grinding path in machine co-ordinates and generates corresponding NC subprograms. They can then be presented in the SIGSpro 3D simulation or transferred to the NC control and worked through.

One possible application of this option is the connection of TD Winnut software from ISBE. Winnut can be used to calculate the required grinding wheel profile for a specified chip flute profile. This profile is transferred together with the associated grinding path via the GDX interface to SIGSpro for further processing.

In a similar manner, other GDX-compatible software packages which, for example, define manufacturer-specific geometries at the drill bit or milling cutter face, can be linked with SIGSpro.

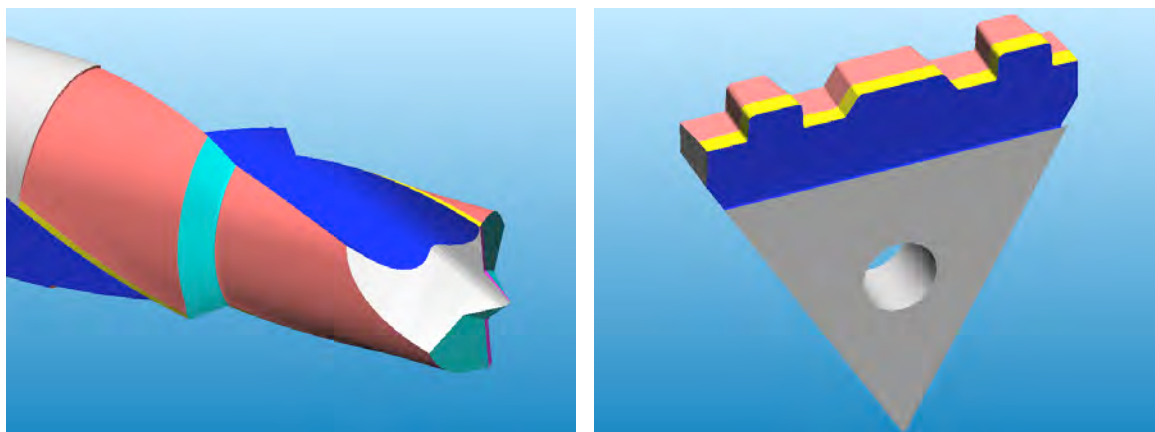


Simulation software

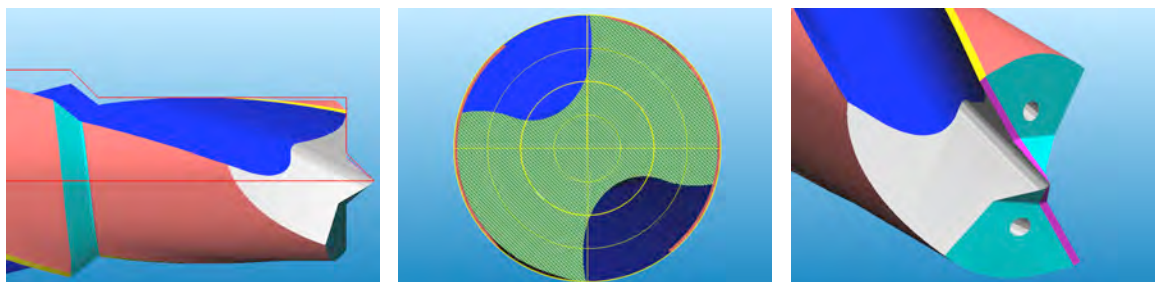
S900: Basic package for simulation of SIGS3d

With this option, SIGSpro is extended by integrated 3D machining simulation. The option is enabled via a USB dongle, which can either be used at the machine or an external workstation (cf. pos. S790). If the 3D simulation is to be used at the machine and external workstation at the same time, a second dongle (cf. pos. S910) is required.

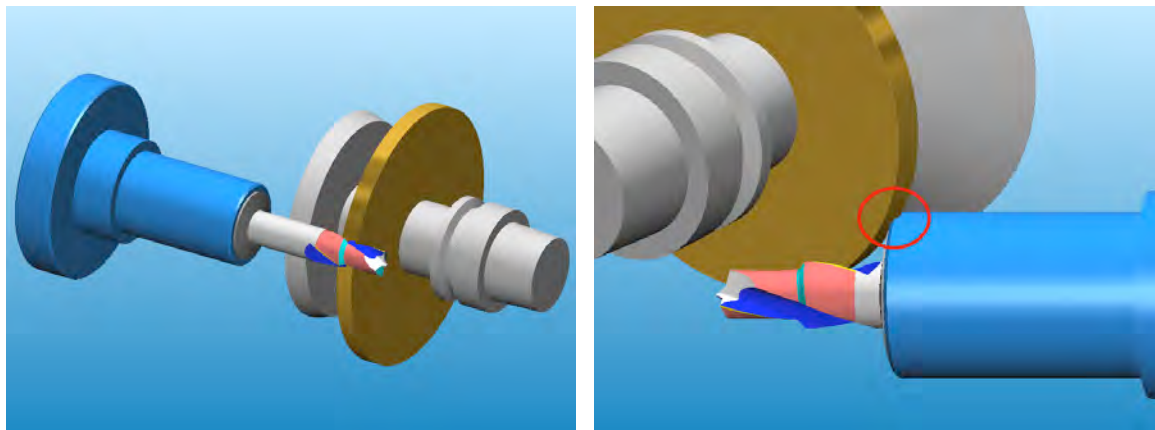
Based on the NC programs calculated by SIGSpro, a 3D model of the ground workpiece is calculated. This model can be shifted, rotated or enlarged as desired at the monitor.



The 3D simulation provides functions for evaluation, measurement and analysis of the ground workpiece. The rotation contour of a drilling tool, for example, can be calculated and compared with the specified contour. Cuts parallel to the main planes or freely definable planes can be calculated. To evaluate rake angles, clearance angles or land widths, a freely configurable grid can be drawn in. Diameters and positions of cooling ducts can be specified and displayed in the 3D simulation.



Grinding wheels and clamping devices can be displayed additionally as an option. With the grinding wheels, a distinction is made in every machining operation between the active and passive grinding wheel (including abrasive arbor). This is important for collision monitoring; the active grinding wheel can be checked for collisions with the clamping device, the passive grinding wheel(s) for collisions with the workpiece and clamping device. Rotationally symmetrical clamping devices can be defined by the customer and used in the 3D simulation and for collision monitoring.



S910: Additional licence for the basic package Simulation SIGS3d

With this option, an additional USB dongle can be purchased in order to use the 3D simulation at the same time at the machine and the external programming station.

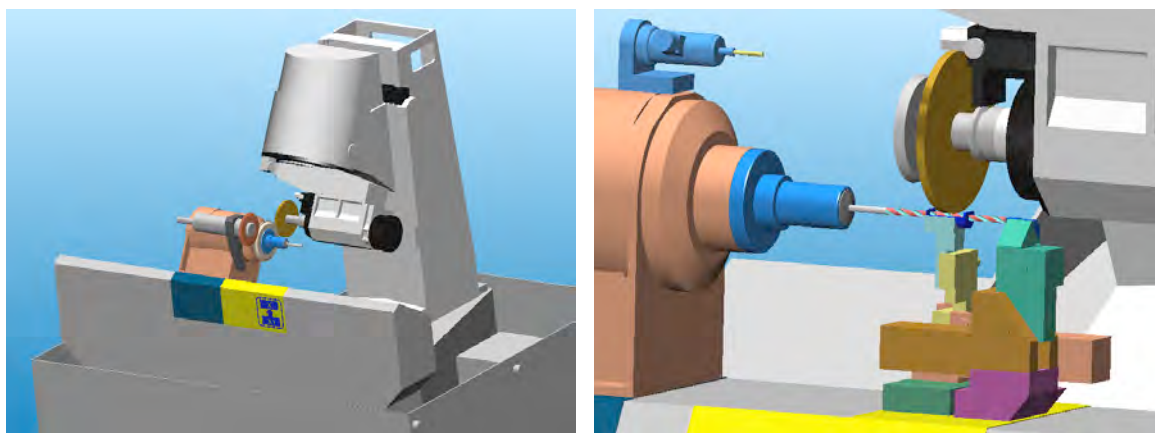
S920: Extension package SIGS3d machining area simulation

Prerequisite: Basic package for simulation SIGS3d (pos. S900 or pos. S910)

With **one** USB dongle, this option allows you to present the complete machine in the 3D simulation. If this option is desired at several workstations, the corresponding number of dongles must be ordered.

The machining area simulation takes the following into consideration: the complete basic machine, the measuring probe, clamping aids (support, tailstock, workpiece guidance system), the dressing unit(s), the sharpening unit and the additional buttons for grinding wheel measurement.

The collision monitoring system is able to detect collisions between all named machine components. The customer can set which checks are to be made.



S930: Extension package SIGS3d model export

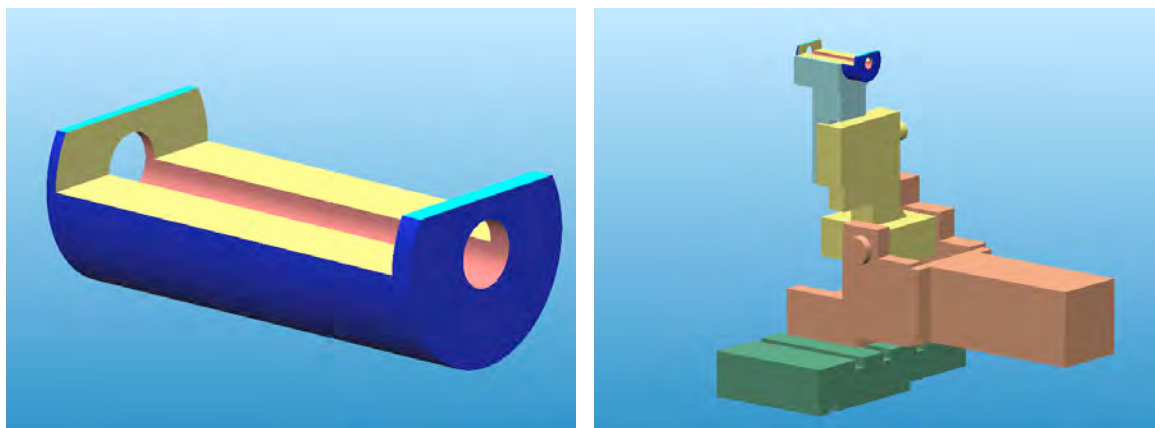
Prerequisite: Basic package simulation SIGS3d (pos. S900)

This extension package makes it possible to export the simulation result (ground workpiece) into conventional 3D interchange formats. The formats IGES, STEP, STL and VRML are currently supported.

S940: Extension package for editable 3D models for clamping devices and clamping aids

Prerequisite: Extension package SIGS3d machining area simulation (pos. S920)

Prisms, half shells and bushings for the support and tailstock centres are often adapted by the customer to the respective machining situation. To present these components in a realistic manner and to check for collisions, this extension allows the customer to prepare the 3D models for these components himself and to add them to the 3D simulation. For this purpose, geometrical bodies (cylinders, spheres, cubes, ...) can be prepared, positioned, combined with one another or cut in a simple dialogue. The result is converted to a 3D format and used in a 3D simulation.





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SERIES 305 AND 325