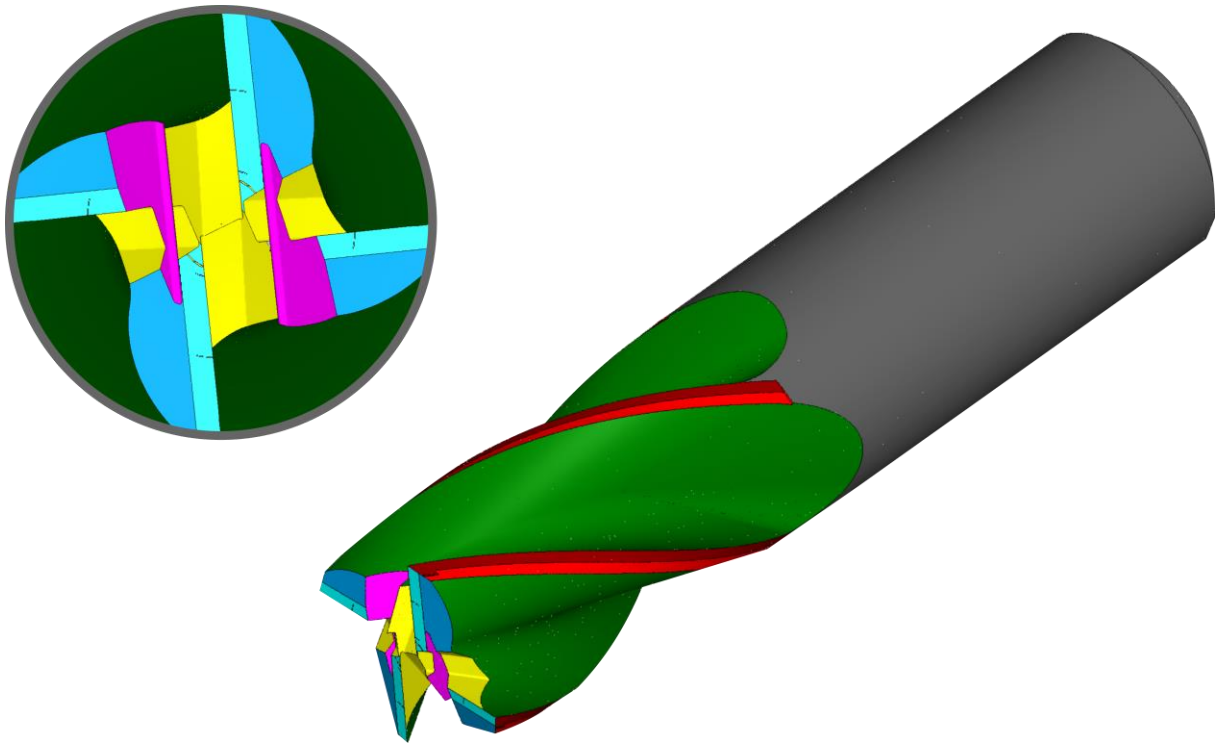
MTS AG
Mathematisch-Technische-Software

tool-kit PROFESSIONAL by MTS AG

Software-Modules

Spezification

Stand: 11.01.21



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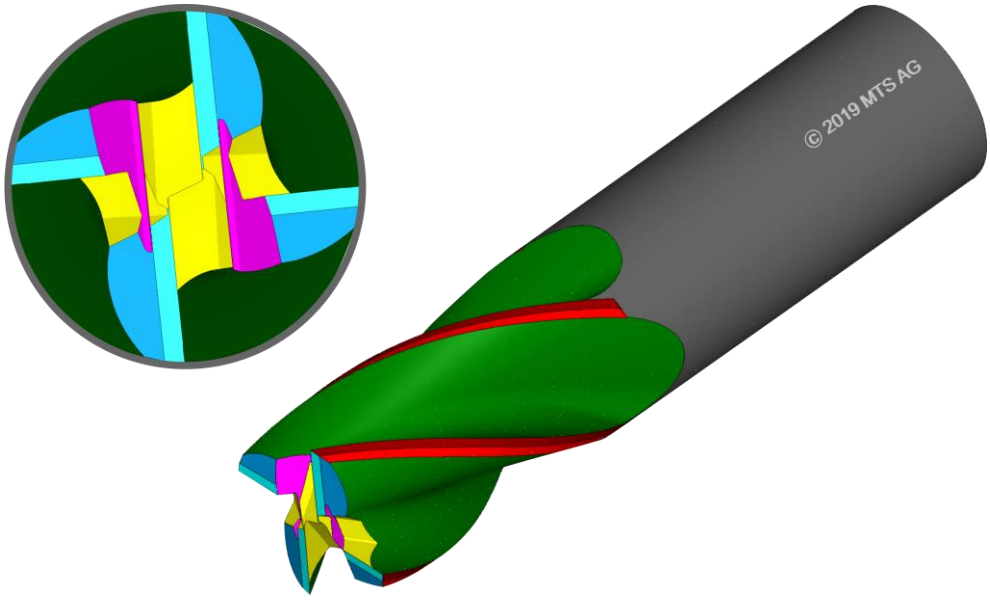
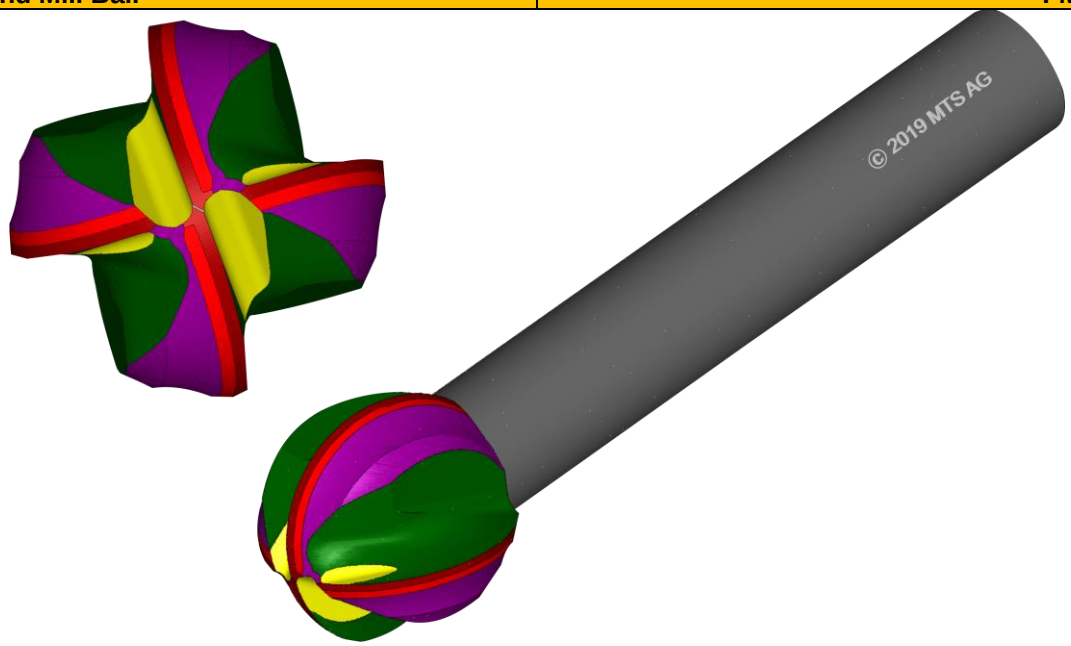
MTS AG
Mathematisch- Technische Software

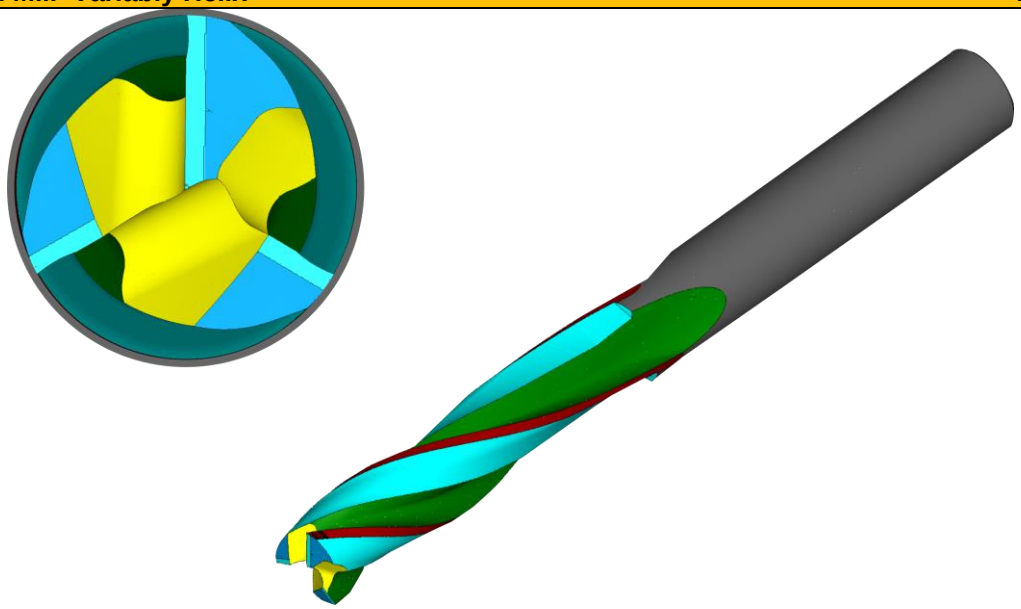
1.1 End Mills	FMENU



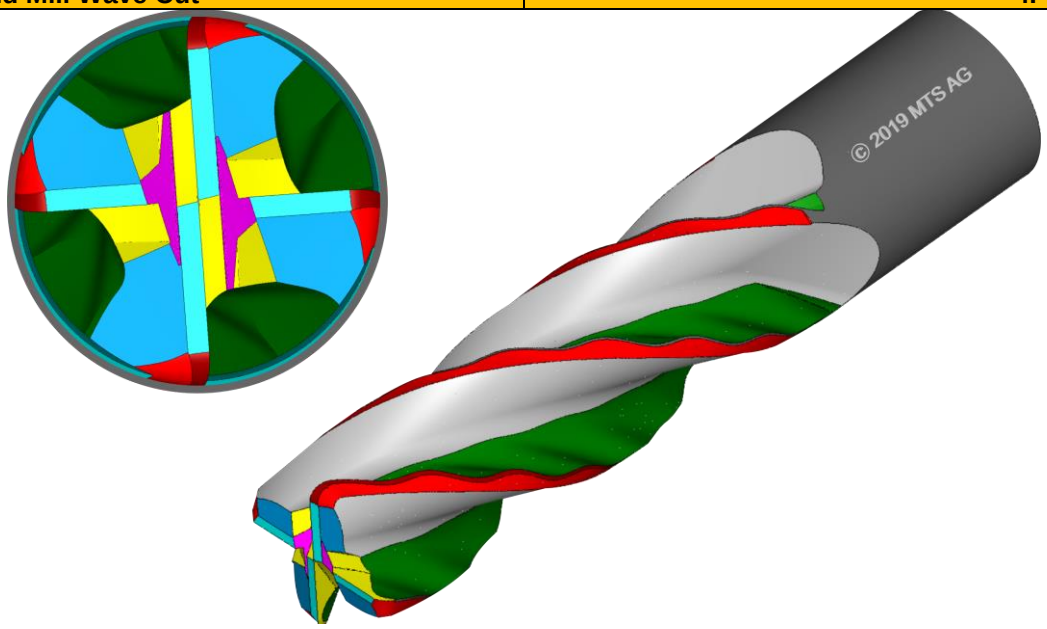
1.1 Basic Modul End Mills	
• **Workpiece:** Cylinder Taper Angular Cutter • **Point:** Plan Face Chamfer Corner Radius Ball Nose Circular Arc Double Radius • **Geometry:** Regulare 2 at Center 1 above Center Centring Point 3 at Center 4 at Center • **Cutting Edge Combination:** right helix/right cutting left helix/left cutting right helix/left cutting left helix/right cutting • **Division:** Equal / unequal division of teeth • **Periphery** Linear relief: 1st/ 2nd /3rd relief angle Radial relief: Cross-/ longitudinal Roughing Grind direction: Forward / backward Optional spark out grinding.	• **Production / Regrinding:** Production by different infeed (several steps) Regrinding with calculation of removal length, periphery and rake. Regrinding, finishing with different wheels • **Main Fluting** Meas. definition: Point-/ normal cut Grind direction: Forward / backward Optional spark out grinding • **Taper**: Constant angle / constant helix Regrinding with undefined helix • **Notching** Radius at entry and exit Variable entry- and aperture angle • **Profile Simulation** Simulation of intersection at all operations Wheel/workpiece-simulation Machining simulation • **Shank** Reducing the shank diameter Clamping area

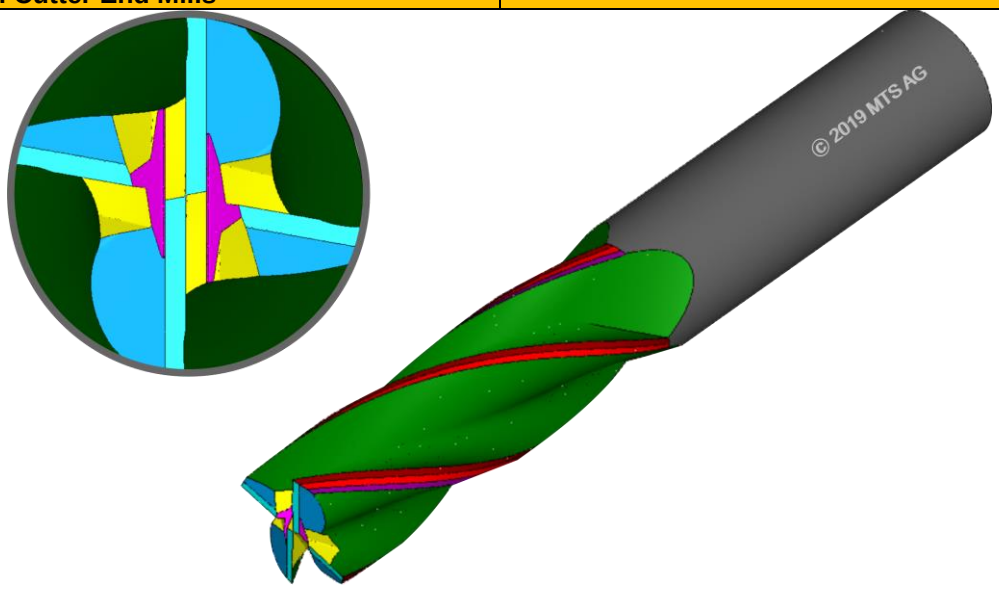
1.2 End Mill Ball	FMENU
	
1.2 Ball **Extension to 1.1:**	
• Ball	

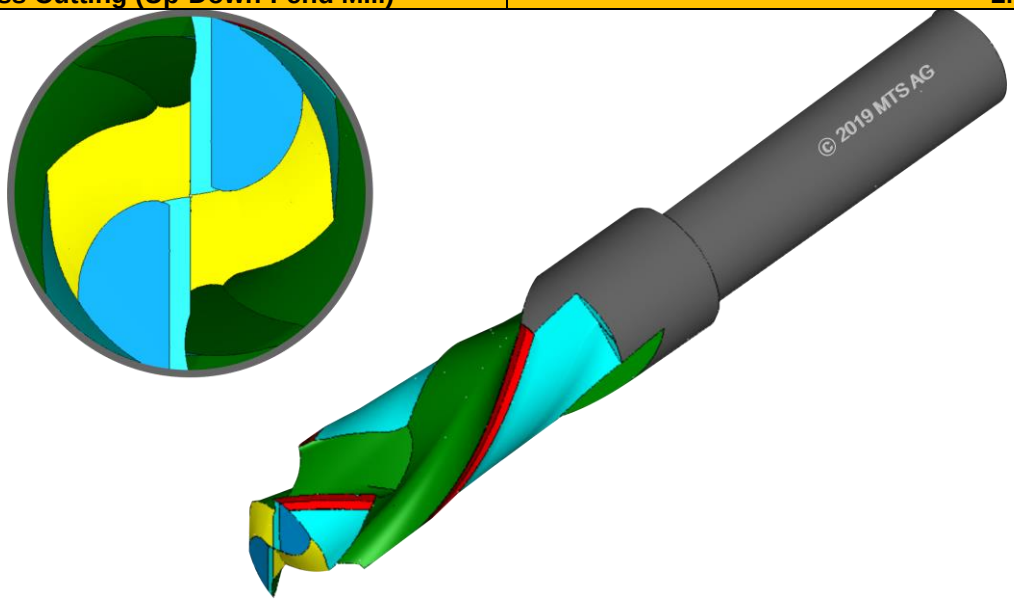
1.3 End Mill Variably Helix **FMENU**



1.3 Variably Helix **Extension to 1.1:**	
• **Variably Helix of Fluting:** • Cylindrical and tapered tools	• Front and rear angle of helix • 3 sections: Constant angle within 1. and 3. section; transition between front and rear helix-angle within 3. section • Rising or falling helix

1.4 End Mill Wave Cut	4FMENU
	
1.4 Wave Cut(Crest-cut) **Extension to 1.1:** **(Production only; regrinding on demand)**	
• **Cylindrical tools** Roughing cutting corresponding to a sinusoidal cutting edge along the helix Period and amplitude of wave according to sinus-function Starting point offset at every tooth Orientation of wave to the tool-center or to the cutting edge	

2.1 Multi Cutter End Mills	MMENU
	
2.1 Multi Cutter End Mill Basic	
• **Specification:** Cylindrical standard end mills 2 teeth at center: max. 8 teeths • **Geometry:** Tools with 2 at center geometry Tools with groups of different fluting and periphery cutting edges: 2 teeth: 2 groups 3 teeth: 3 groups 4 teeth: 2 or 4 groups 5 teeth: 5 groups 6 teeth: 2 or 3 groups 8 teeth: 2 or 4 groups • **Division:** Different tooth division	

2.2 Cross Cutting (Up-Down-Fend Mill)	2MMENU
	
2.2 Cross Cutting (Up-Down-End Mill) **Extension to 2.1:**	
Cross Cutting: • 2, 3 or 4 teeth tools with two crosswise • cutting edges for each tooth: • Primary fluting: right helix • Cross cutting: left helix • Axial and radial tooth offset • Cutting lengths and approach strategies are freely selectable.	
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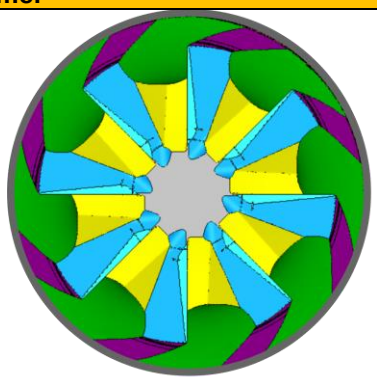
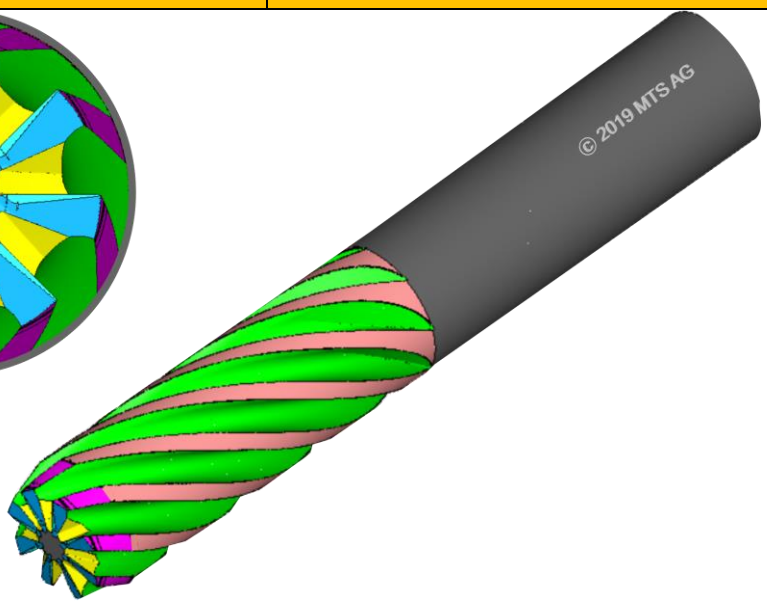
2.3 1-Tooth Cross Flute	**3MMENU**
2.3 1-Tooth Cross Flute **Extension to 2.1:**	
• 1-Zahn Cross Flute	

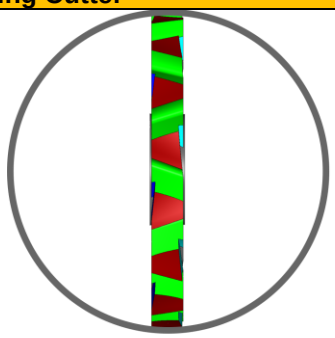
3.1 Reamer	**RMENU**

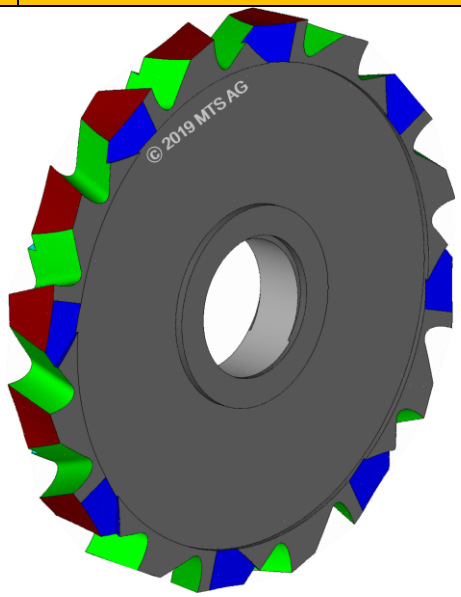




3.1 Basic Modul Reamer	
• **Work Piece:** 1. Cylinder 2. Taper • **Face:** Plane without cutting edge Milling end face • **Cutting Edge Combination:** right helix/right cut left helix/left cut right helix/left cut left helix/right cut • **Devision:** equal unequal (free division between all teeth) • **Preparation:** Separation Profile roughing Profile finishing • **Production / Regrinding** Production in several infeeds • **Main Fluting:** Workpiece with pairs of different fluting geometries	• **Periphery** Like end mills Pos. 1. • **Heel:** Like end mills Pos. 1. • **Chamfer** Linear relief: 1./2./3. relief angle Radial relief: transverse/longitudinal • **2nd Chamfer** Optional: 2nd chamfer • **Chamfer:** Face groove grinding.

4.1 Side Milling Cutter	NMENU



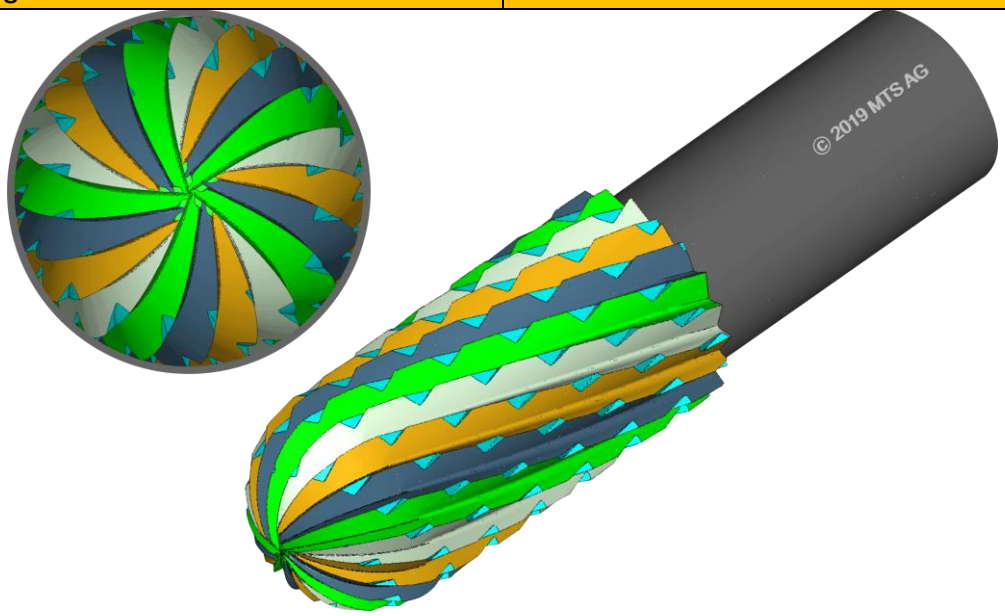


4.1 Basic Modul Side Milling Cutter

- **Workpiece:**
  Cylinder
  Trapecoid
  Prisma
  Half Angle
  Full Radius
- **End Faces:**
  Plan Face
  Chamfer
  Corner Radius
- **Teeth:**
  Standard teeth
  Staggered teeth
  Staggered/skipping teeth
- **Production / Regrinding**
  Production by different infeed in several steps
  Regrinding with calculation of removal length, periphery and rake.
  Regrinding, finishing with different wheels
- **Main Fluting**
  Meas. definition: Point-/ normal cut
  Grind direction: Forward / backward
  Optional spark out grinding

- **Periphery:**
  Linear relief: 1st/ 2nd /3rd relief angle
  Radial relief: Cross-/ longitudinal
  Grind direction: Forward / backward
  Optional spark out grinding
- **Heel**
  Grind proc.: Crosswise-/ longitudinal
  Production by different infeed (several steps)
  Grind direction: Forward / backward
  Optional spark out grinding
- **Face Relief:**
  like end mills
- **Gashing, front/rear:**
  like end mills
- **Chamfer front/rear:**
  like end mills
- **Periphery**
  Linear grinding: 1st / 2nd / 3rd clearance angle
  Arch grinding: cross / longitudinal
- **Grinding process**
  Grinding direction: forward / backward
  Radius cutters can grind the peripheral chamfer in one go for the front and back.

5.1 Burrs	DMENU

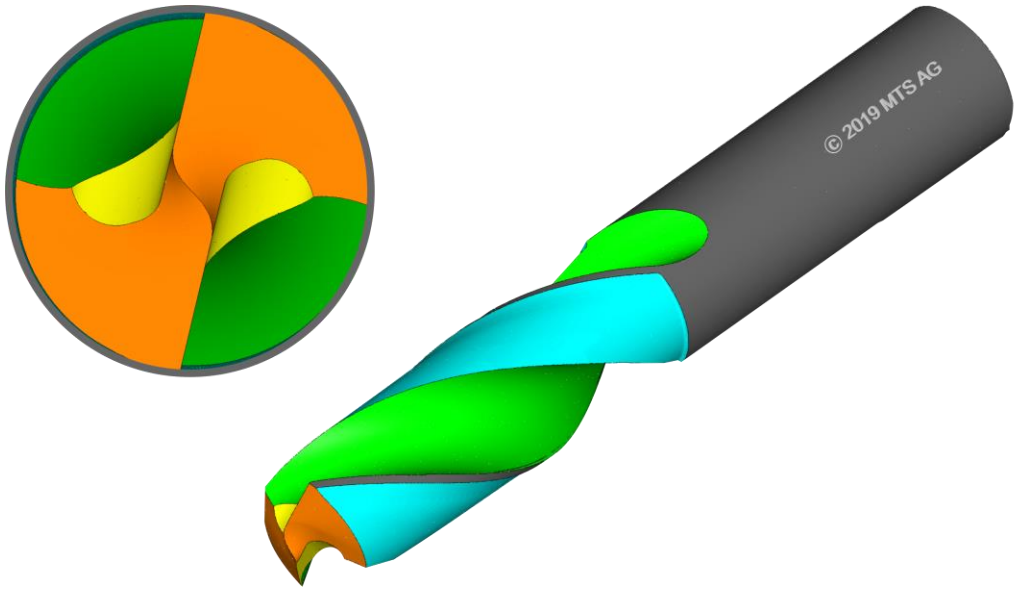


5.1 Basic Modul Burrs

- **Profile Construction:**
  Free selectable sequence including:
- **Front:**
  End face
  Point
  Chamfer
  Sphere
  Ball nose
  Enlarged radius
  Double radius
- **Middle:**
  Cylinder
  Increasing taper
  Downgrade taper
  Convex radius
  Concav radius
- **Back:**
  Cylinder
  Taper
  Radius
- **Standard Fluting:**
  Cut to center
  Section fluting
  Two to center
  Groove cut
- **Double Cutting:**
  Optional

- **Chip breaker:**
  Optional
- **Grinding Direction:**
  Forward
  Backward
  Bidirectional
- **Periphery:**
  Optional
- **Alucut for Industrie-Burrs**
- **Roughing teeth for bone cutters**
- **Secondary flute**
- **Drill point and milling face are possible.**

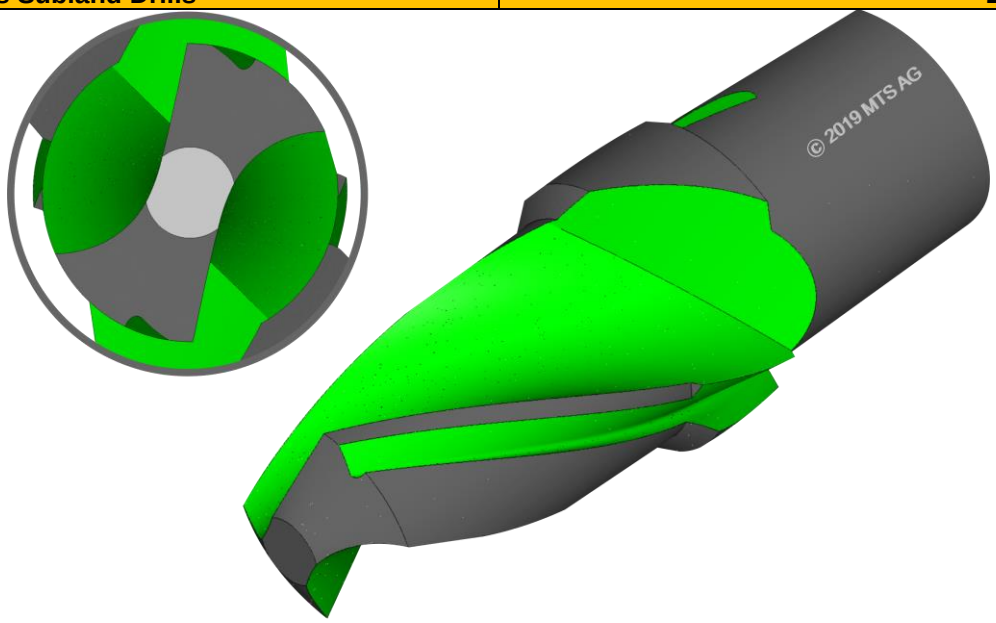
6.1 Drills	BMENU

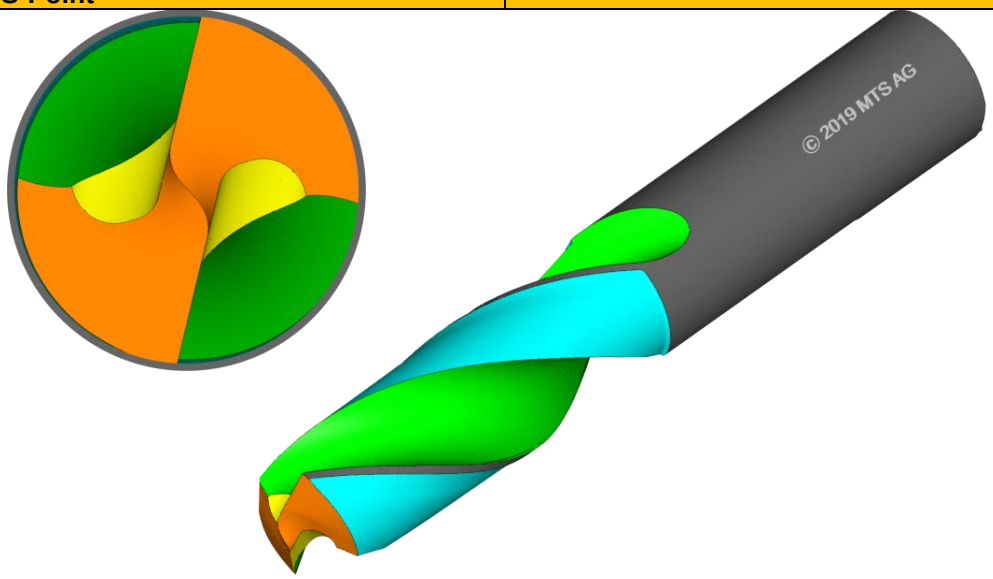


6.1 Basic Modul Drills

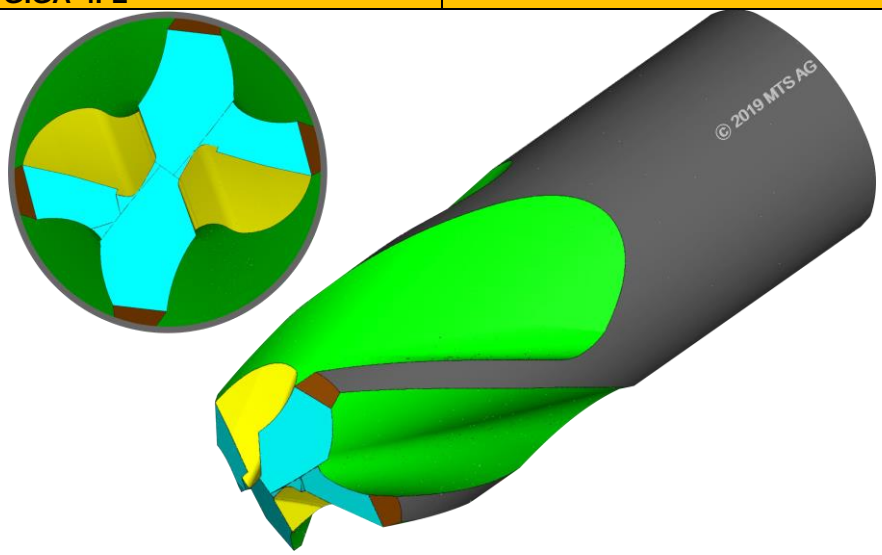
- **Work Piece**
  2 or 3 teeth
  1 – 5 Steps
- **Cutting Edge Combination:**
  right helix/right cut
  left helix/left cut
- **Produktion / Regrinding**
  Production by different infeed (several steps)
  Regrinding with calculation of removal length, periphery and rake.
  Regrinding, finishing with different wheels
- **Preparation:**
  Separation
  Profile roughing
  Profile finishing
- **Point**
  Standard
  Split point
  2-facet point
  4-facet point
  6-facet point
  Delta – point
  M – point
  Kevlar – point
  Centring point
  Milling end face

- **2nd Chamfer**
  Optional: 2nd chamfer
- **1st Web Thinning**
  Correction of main cutting edge
  Correction of chisel edge
  S-web thinning (incl. Sumitomo like)
  Free constructed notchings / corrections
- **2nd Web Thinning**
  Correction of main cutting edge
  Correction of chisel edge
- **Main Fluting**
  Meas. definition: Point-/ normal cut
  Grind. direction: Forward / backward
  Optional spark out grinding
  Separated fluting per step
- **Periphery**
  Radial grinding / Round grinding
  Transverse/longitudinal positioning
  Linear relief: 1./2. relief angle
- **Steps**
  Standard step (axial/radial relief angle)
  Step aperture angle: 45 - 200°
  Linear relief step (aperture angle ≥ 170°)
- **Chip Breaker**
  1 or 2 chip breakers per tooth
- **Production from standard- to step drill**
  Special measurement and calculation program

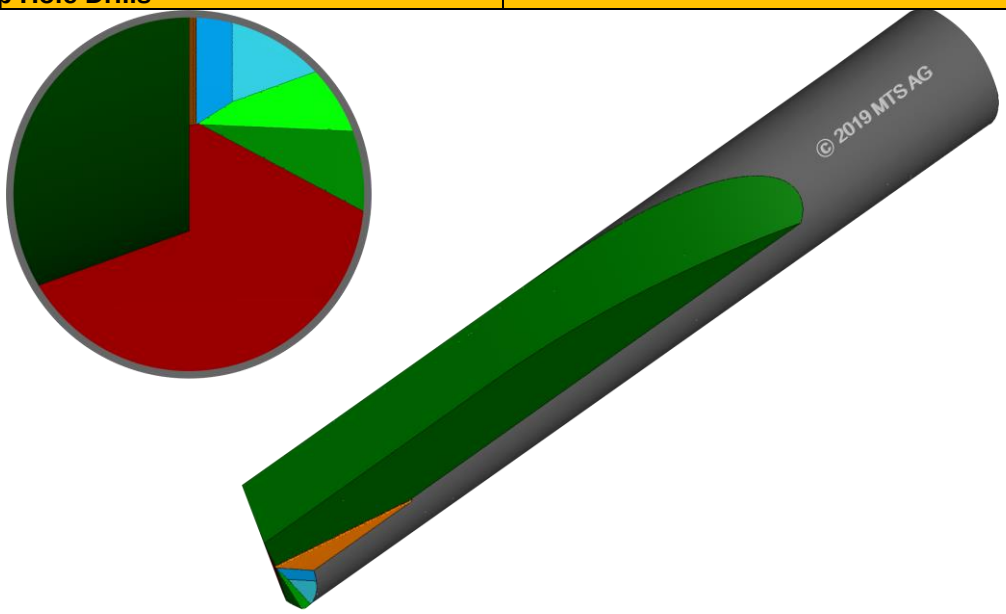
6.2 Drills Subland Drills	**2BMENU**
	
6.2 Subland Drills **Extension to 6.1:**	
• **Specification according to Standard-/Stepping Drills** • **Secondary Fluting** Defined rotation against main fluting Stufe	

6.Drills S-Point	**3BMENU**
	
6.3 S-Point **Extension to 6.1:**	
• **S-Point:** 2- and 3-Teeth	

6.Drills Woodworking Tools	**4BMENU**
6.4 Woodworking Tools **Extension to 6.1:**	
• Drills for woodworking: At the moment available: • Pin-drill • Forstner-drill	

6.Drills MTS-GIGA-4FL	5BMENU
	
6.5 MTS-GIGA-4FL **Extension to 6.1:**	
• Special point with 4 teeth / flutes: There are 4 main cutting edges, each including a 4-facet-points and a 4-facet-chamfer, splitted into two groups. The main group is constructed by a typical 4-facet-point while the secondary group is done by shortened teeth. (like a end mill tool with 2-to-center-geometry). • The two-stepped Giga-Drill is like a typical subland-drill-geometry.	

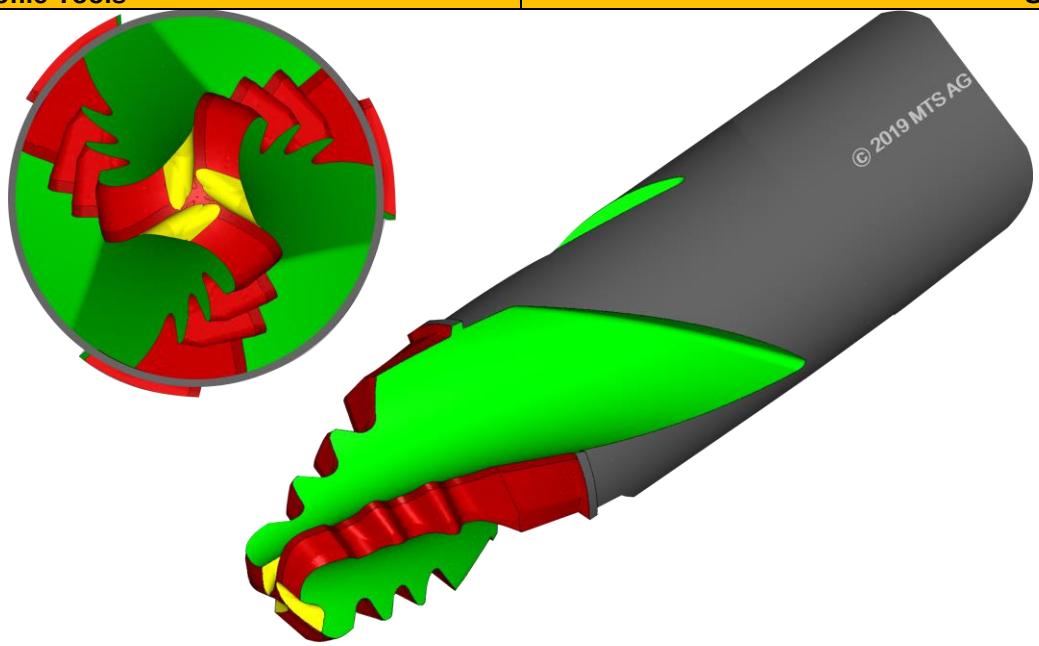
7.1 Deep Hole Drills	TMENU



7.1 Basic Modul Deep Hole Drills

- **1 and 2-Cutter**
- **Preparation**
  Cut-off
  Roughing
- **Point Clearance:**
  Up to 5 different clearances
- **Chamfer:**
  Optional: Chamfer grinding
- **Main Fluting:**
  Straight Gashing
- **Secondary Fluting:**
  Optional: Sec. flute
- **Web Thinning:**
  Corrected main cutting edge
  Corrected chisel edge
- **Chamfer/edge rounding**

8.1 Profile Tools	SMENU



8.1 Basic Modul „Increasing/Downgrade Profile “

- **Workpiece:**
  Tools with increasing and **falling** profile
- **Point and Geometry:**
  Milling End Face like 1.1
  Drills Point like 6.1
- **Cutting Edge Combination:**
  right helix/right cut
  left helix/left cut
- **Production / Regrinding:**
  Production by different infeed (several steps)
  Regrinding with calculation of removal length, periphery and rake.
  Regrinding, finishing with different wheels
- **Profile:**
  CAD-system for profile construction
- **Profile Element:**
  Straight line
  Edge
  Convex / concave radius
  Chamfer
  Increasing / downgrade profile
  Free selectable sequence of the profile elements

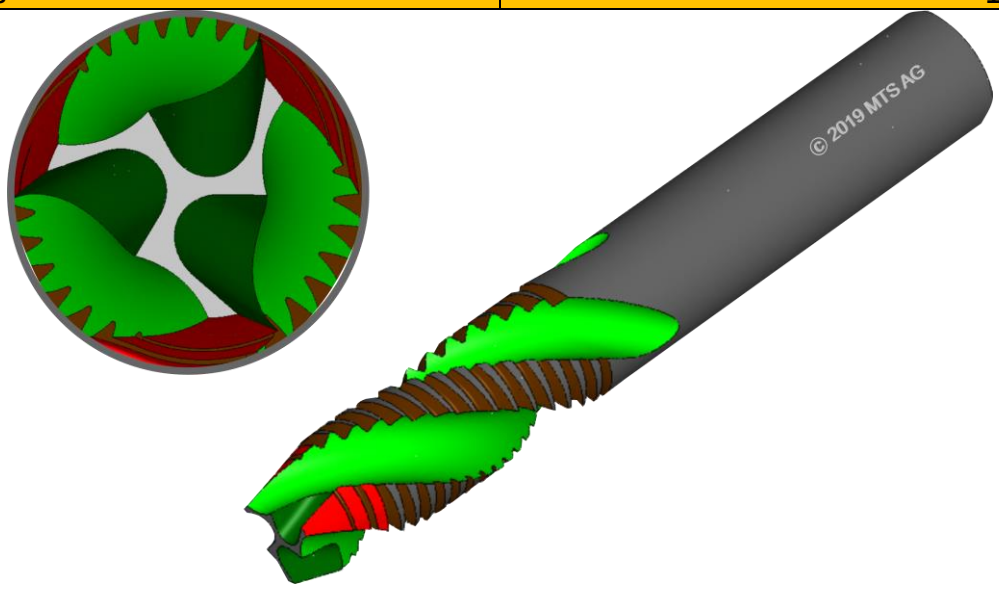
- **Preparation:**
  Separation (cut off)
  Profile roughing
  Profile finishing
  Straight polishing
  Corresponding to a defined blank profile
- **Main Fluting:**
  Straight fluting
  Tapered fluting
  Spade drill fluting
- **Periphery:**
  Linear relief: 1st/ 2nd /3rd relief angle
  Radial relief: 1st relief angle
  Cylindrical relief
  Raised land fluting
  Multi facet raised land fluting
- **Extension: Reading DXF-Format**
  Reading an external created **DXF-file**
  Konverting into MTS-file-format
  autom. sorted elements
  autom. corrected sequence
  autom. corrected orientation
  Selecting the particular layer
- **DXF-Standard:**
  AutoCAD Version 12
  DXF-identification-code „AC1008“

8.2 Profile Tools Multi Fluting Geometry	**2SMENU**
8.2 Multi Fluting Geometry **Extension to 8.1:**	
• **Multi Fluting Geometry:** Up to 5 flutings with separate definition but common cutting edge	

8.3 Profile Tools Radial Periphery	**3SMENU**
8.3 Radial Periphery **Extension to 8.1:**	
• **Radial Periphery:** Radial periphery along discretionary sections Special grinding procedure by radius wheel	

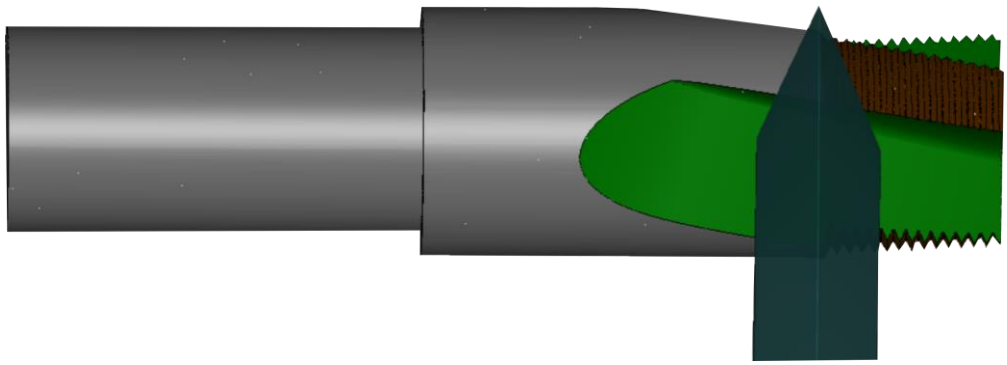
8.4 Profile Tools Multi Cutter Geometry	**4SMENU**
8.4 Multi Cutter Geometry **Extension to 8.1:**	
• **Multi Cutting Geometry:** Multi cutting tools with 2 Groups In pairs different cut geometry	

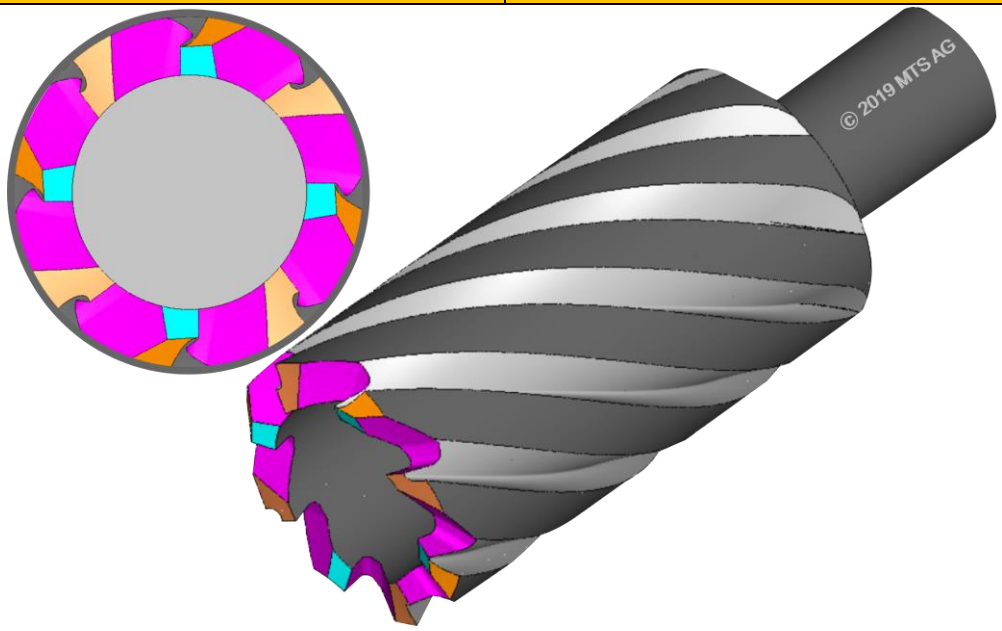
9.1 Taps	1GMENU



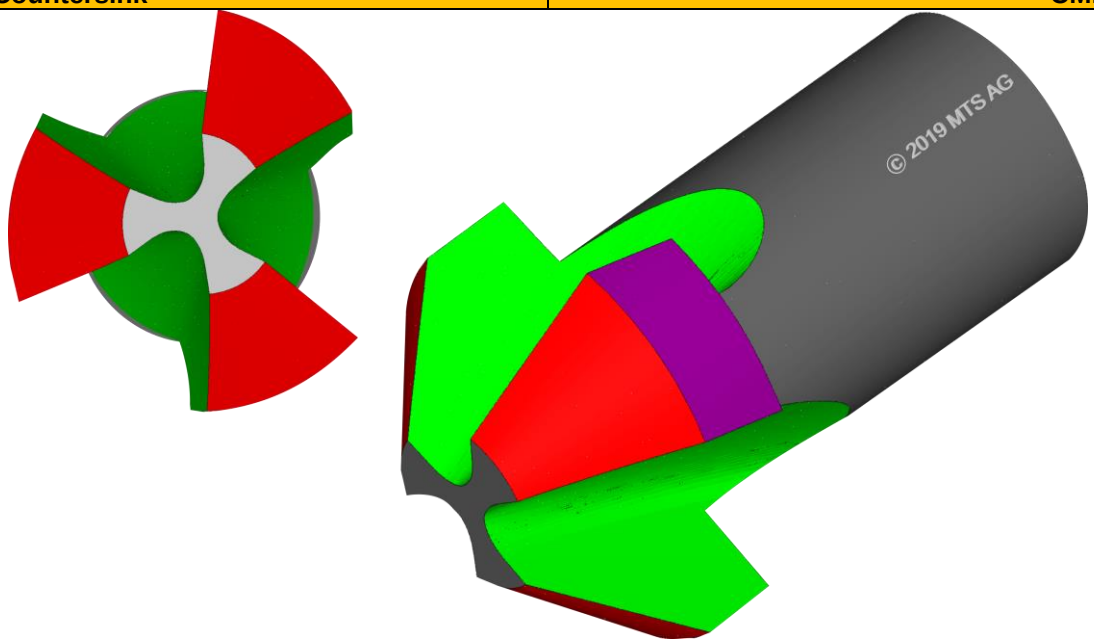
9.1 Basic Modul Taps	

- **End Face:**
  Plan Face
  Centering Point
  Clearance
  Centering P. + Clearance
  Spigot
- **Cutting Edge Combination:**
  right helix/right cutting
  left helix/right cutting
  left helix/left cutting
  right helix/left cutting
- **Preparation:**
  Separation
  Profile roughing
  Profile finishing
- **Main Fluting:**
  Using standard- or radius wheels
- **Chamfer:**
  Type of grinding: longitudinal/transverse
  Chamfer angle
  Chamfer length
  Chamfer radial relief
- **Gashing:**
  Radial cut angle
  Axial cut angle
  With radius- or rounded cup wheel

9.2 Taps Produktion	**2GMENU**
	
9.2 Taps Produktion **Extension to 9.1**	
• **Tap production:** Production by profile-wheel (Wheel-defintion by DXF- or point discription) Radial relief	

10. Core Drills	KMENU
	
10.1 Basic Modul Core Drills	
• **Workpiece:** Cylindical workpiece (like 1) • **End Face:** 1./2. relief angle Concavity Negat./posit. dish angle Outer cutting edge, inner cutting edge Regular/changing teeth geometry • **Chamfer:** 1./2./3. relief angle • **Notching:** 1 to 3 notchings per tooth Constructable cutting positions Roundings at entry and exit Variable aperture angle. • **Radial relief grinding (Heel).**	

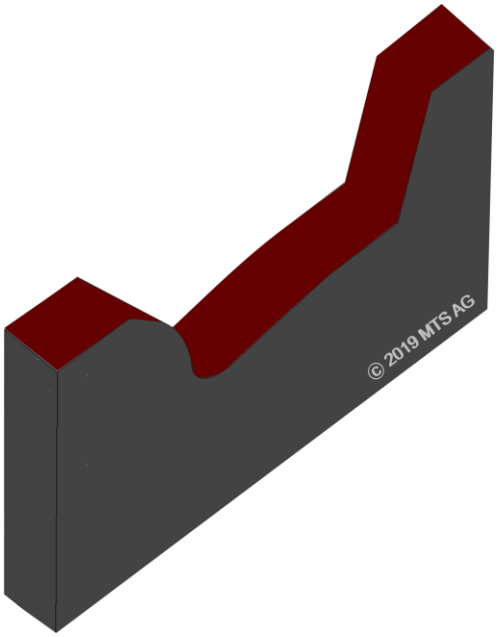
11. Countersink	**CMENU**



11.1 Basic Modul Countersink	

- **Point:**
  Plane
- **Cutting Edge Combination:**
  right helix/right cutting
  left helix/left cutting
- **Production / Regrinding:**
  Production by different infeed (several steps)
  Regrinding with calculation of removal length, periphery and rake.
  Regrinding, finishing with different wheels
- **Preparation:**
  Separation
  Profile roughing
  Profile finishing
- **Fluting:**
  Taper flute like end mills
  Counter flute with special grinding procedure
- **Chamfer:**
  Axial/radial relief angle
- **Rear Section:**
  Cylindrical grinding
- **Plane End Face**

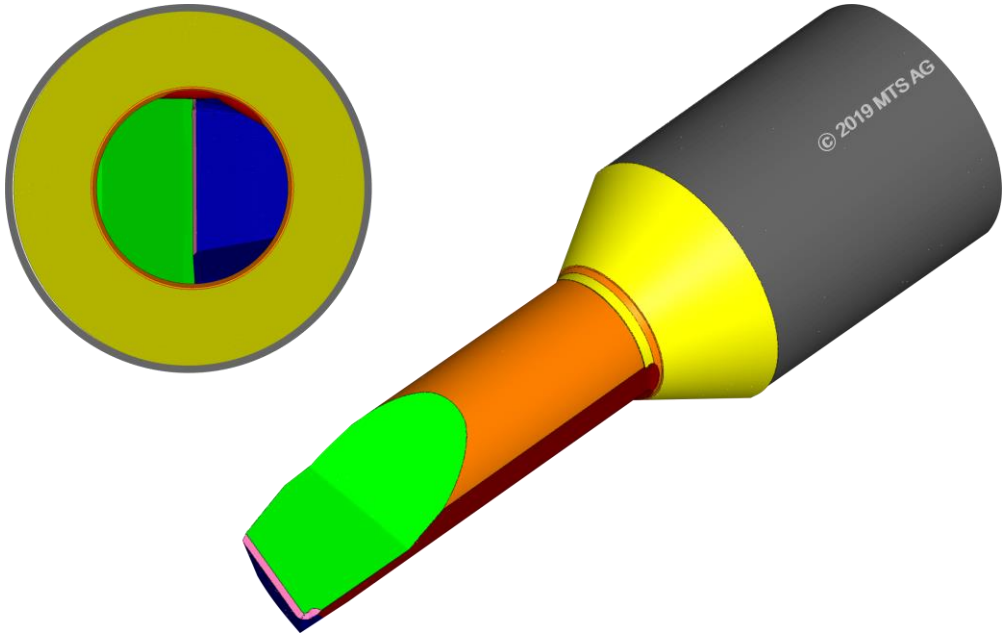
12. Profile Cutter	PMENU



12.1 Basic Modul Profil Cutter	

- **Workpiece:**
  Tools with free selectable profile
- **Profile:**
  CAD-System for profile construction
- **Profile Element:**
  Straight line
  Edge
  Convex / concave radius
  Chamfer
  Free selectable sequence of the profile elements
- **Preparation:**
  Profile roughing
  Profile finishing
- **Lateral Clamping:**
  Straight
  Helix
  Rake angle
- **Periphery:**
  Axial part of relief
  Radial part of relief
  Free selectable grinding position per Element
- **Chuck Database**
- **Profile definition on the plate or in the clamping.**

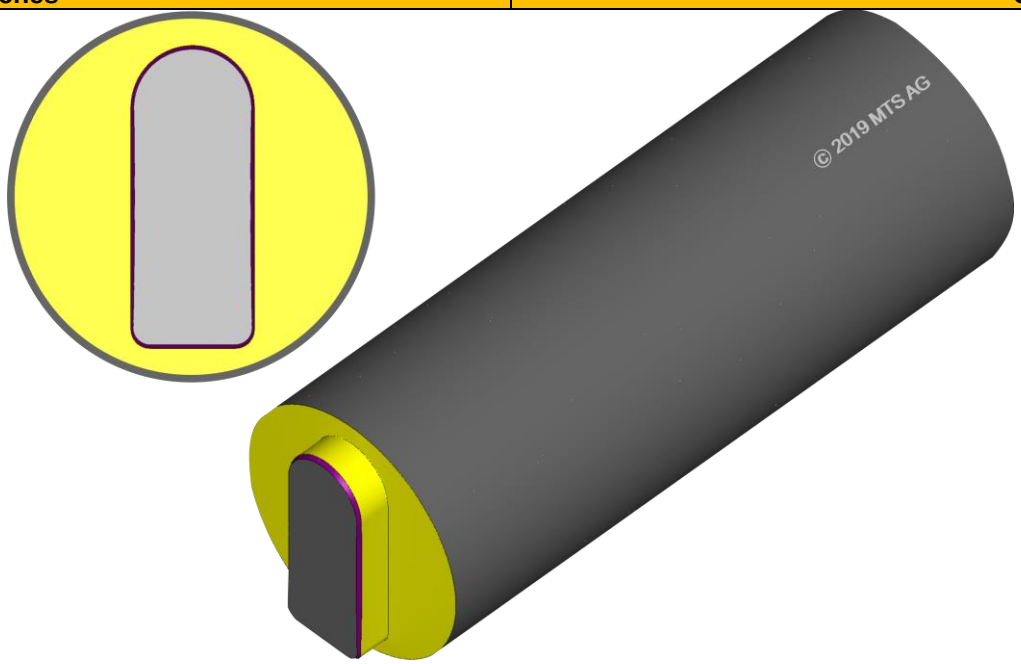
13. Burins / Lathe Tool	IMENU



13.1 Basic Modul Burins / Lathe Tool	

- **Workpiece:**
  Tools with free selectable profile
- **Profile:**
  CAD-System for profile construction
- **Profile Element:**
  Straight line
  Edge
  Convex / concave radius
  Chamfer
  Free selectable sequence of the profile elements
- **Preparation:**
  Profile roughing
  Profile finishing
- **Clamping:**
  Frontal
- **Periphery:**
  Axial part of relief
  Radial part of relief
  Free selectable grinding position per element
- **Main Fluting:**
  Straight fluting
  Sec. gashing

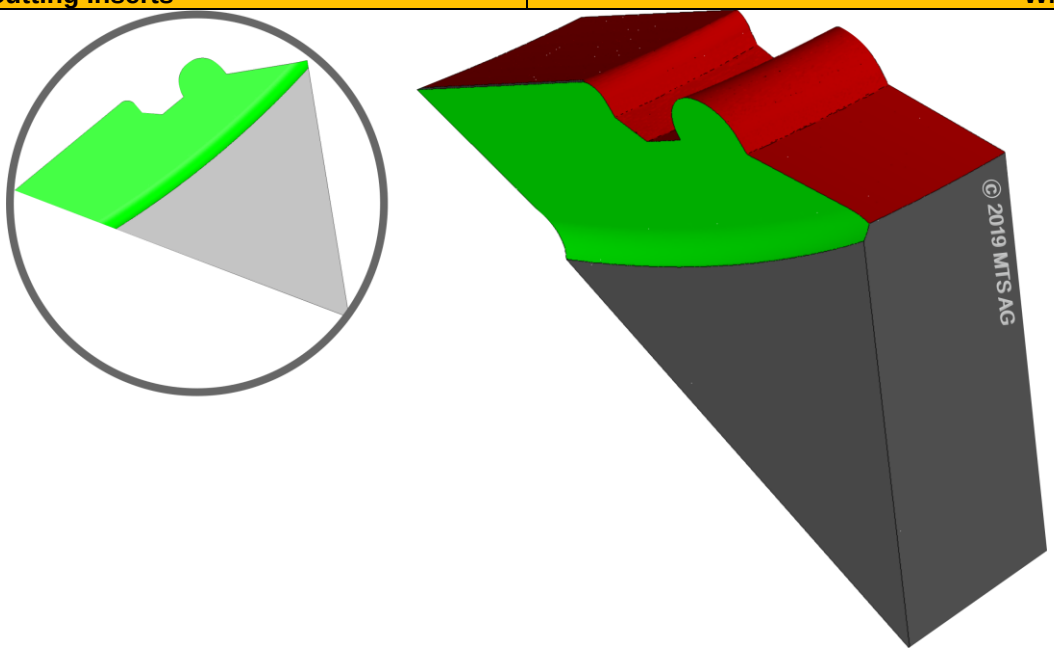
14.Punches	UMENU



14.1 Basic Modul Punches	

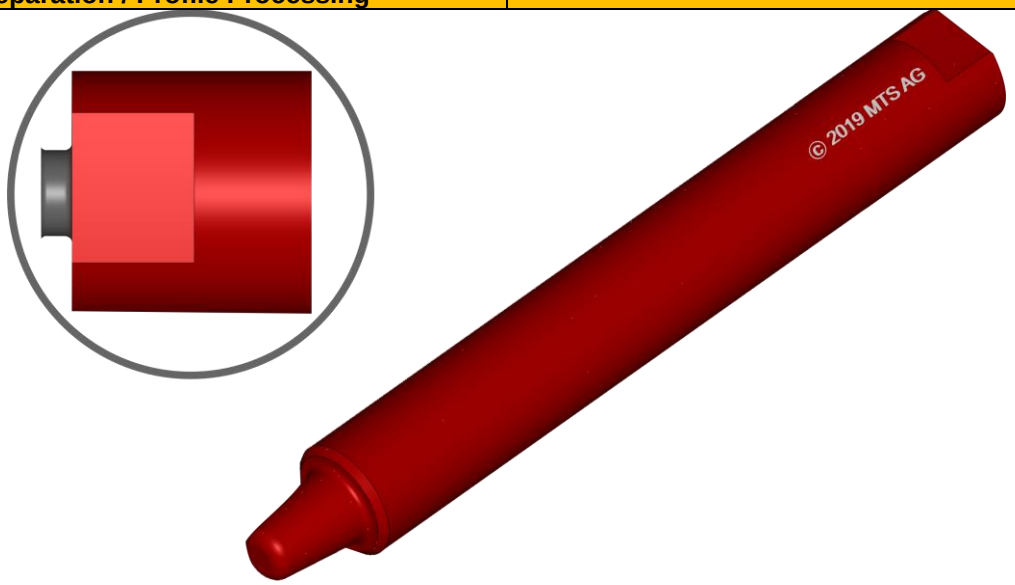
- **Workpiece:**
  Circular grinding of any radial profile
  Any axial profile (shank)
- **Profile:**
  Standard profiles (integrated database)
  Special profiles by integrated CAD-System for profile-construction
  DXF-Import
  Centrical/excentrical profiles
- **Machining:**
  Polygon-preparation
  Profile roughing
  Profile finishing
  Profile polishing
- **Grinding Procedure:**
  Deep grinding
  Circular grinding (equal infeed)
  Circular grinding (dynamical infeed)
  Surface grinding.
- **Torx geometrie**

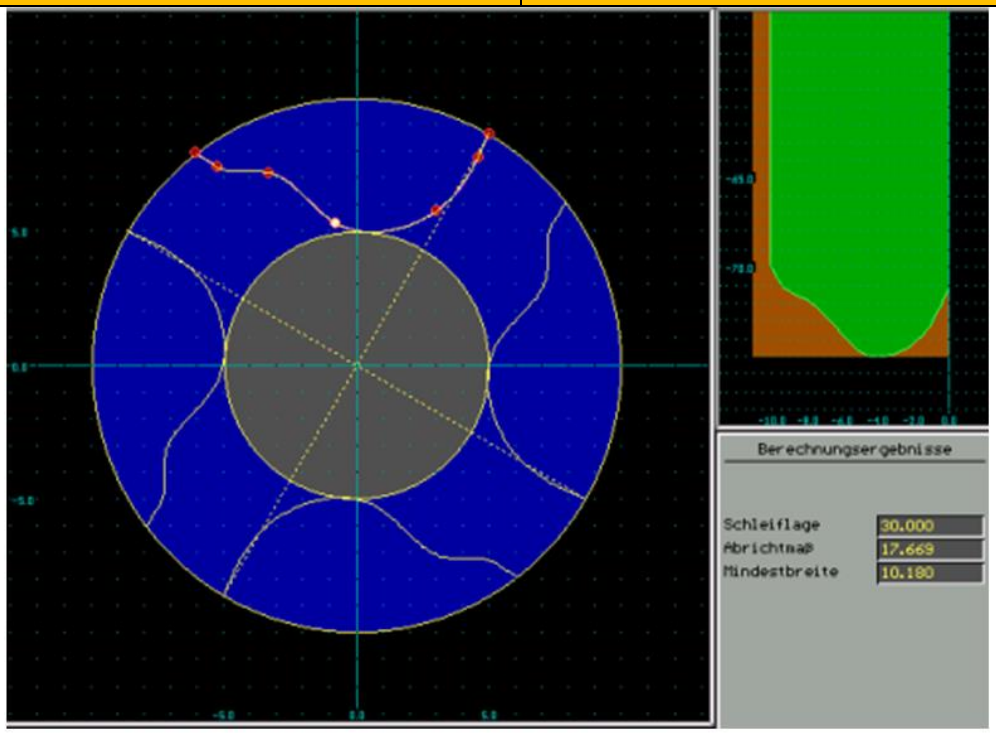
15.1 Cutting Inserts	WMENU



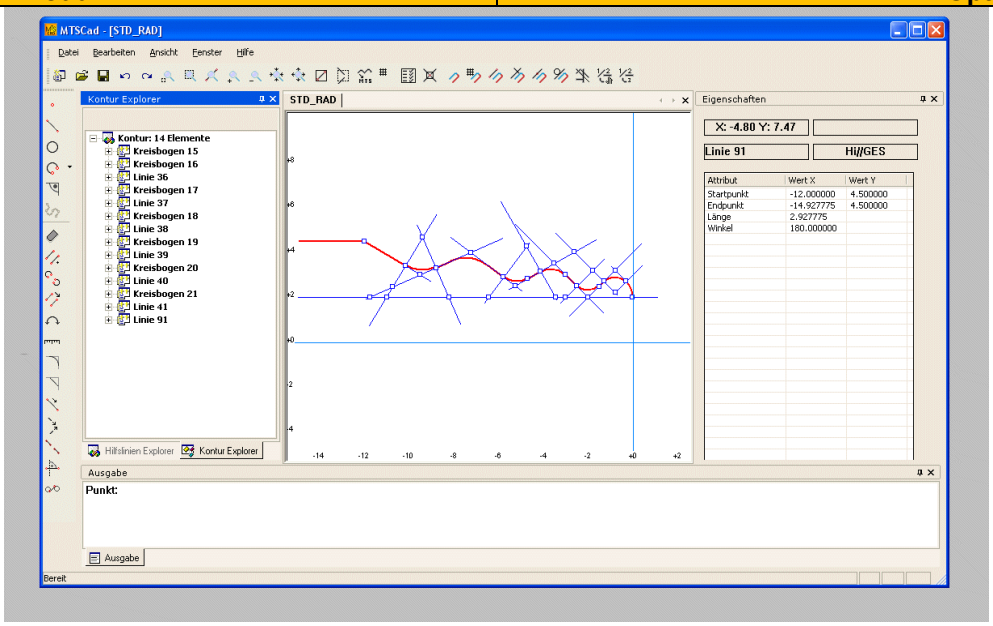
15.1 Basic Modul Cutting Inserts

- **Tool spectrum**
  all convexe insert‘s profile
  outer surface with clearance / chamfering
  tools with longitudinal profile
  tools with transversal profile
  tools with frontal profile
  tools with profile combinations
- **Blank construction**
  blank by standard selection-table
  blank by DXF-definition
- **Machining of outer surface**
  Machinings:
  Roughing
  Finishing
  Polishing.
- **Procedures:**
  Cylindrical grinding
  Linear grinding
  Plunging
- **Chamfering of outer surface**
  Front chamfering
  Rear chamfering
- **Profile definition and machining**
  Free constructed cutting profiles
  Orientation: Longitud., transversal, frontal
  Profile combinations
- **Preparing of profile cutting edge:**
  Roughing
  Finishing
  Chamfering of cutting edge
- **Flute machining**
  Two different procedures:
  Logitudinal grinding
  Transversal grinding (scalping)
- **Recessing and special features**
  Creating recesses and special geometrical elements will be done by MTS-module „Open Procedure“.

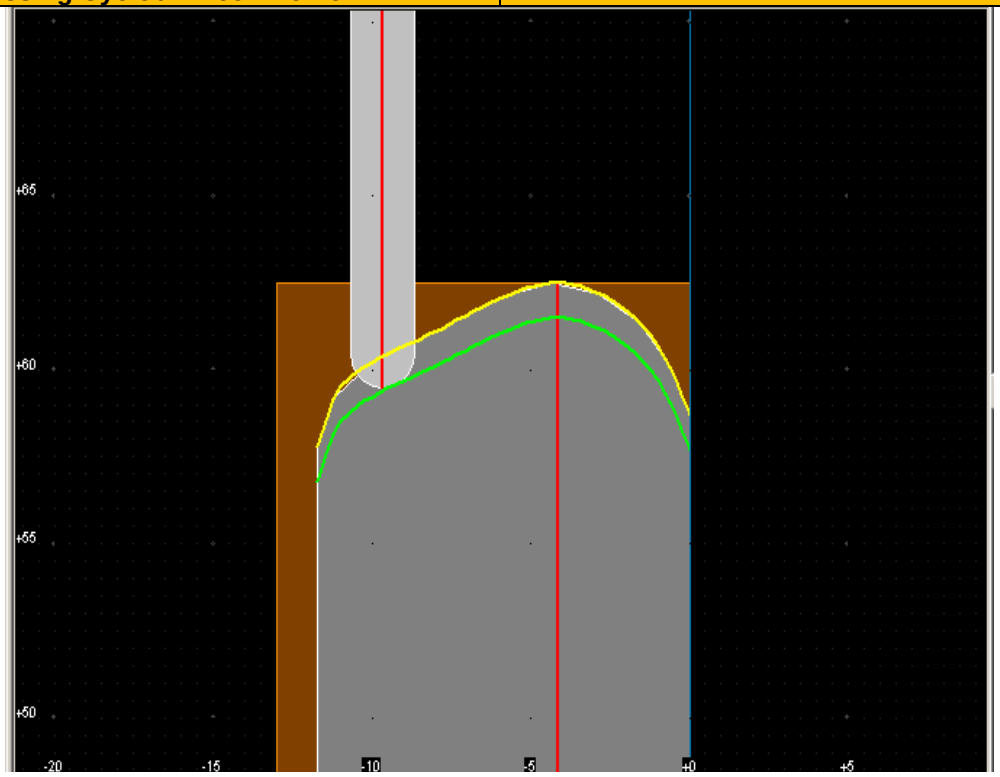
16.1 Preparation / Profile Processing	VMENU
	
16.1 Basic Modul Preparation / Profile Processing	
• **Preparation** • **Separation:** Round Grinding / Depth Grinding • **Point Machining:** Full Point / Centring Point With / no oszillation • **Chamfer:** Round Grinding / Depht Grinding With / no oszillation • **Slot:** (Cooling Channel Connection) • **Clamping Surface:** Form B, 1 Land Form B, 2 Land Form E_1 Form E_2 • **Profile Machining** Increasing / downgrade profiles • **Operations** Roughing Finishing Polishing • **Type of End Face:** Plane Point Centering point	

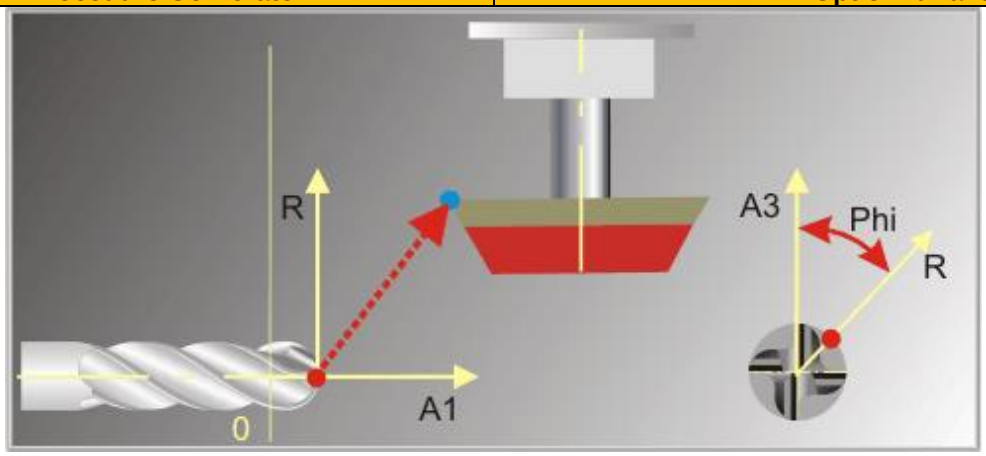
Options	
17.1 Construction of Flute Profile / Wheel Profile	**Options for FMENU / BMENU**
	
17.1 Basic Modul Construction of Flute Profile / Wheel Profile	
• **Construction of Flute Profile:** • Construction by integr. CAD • Calculation of wheel-profile • Calculation of grinding track • Intersection simulation • Output of wheel discription	

18.1 CAD Modul	Option CAD

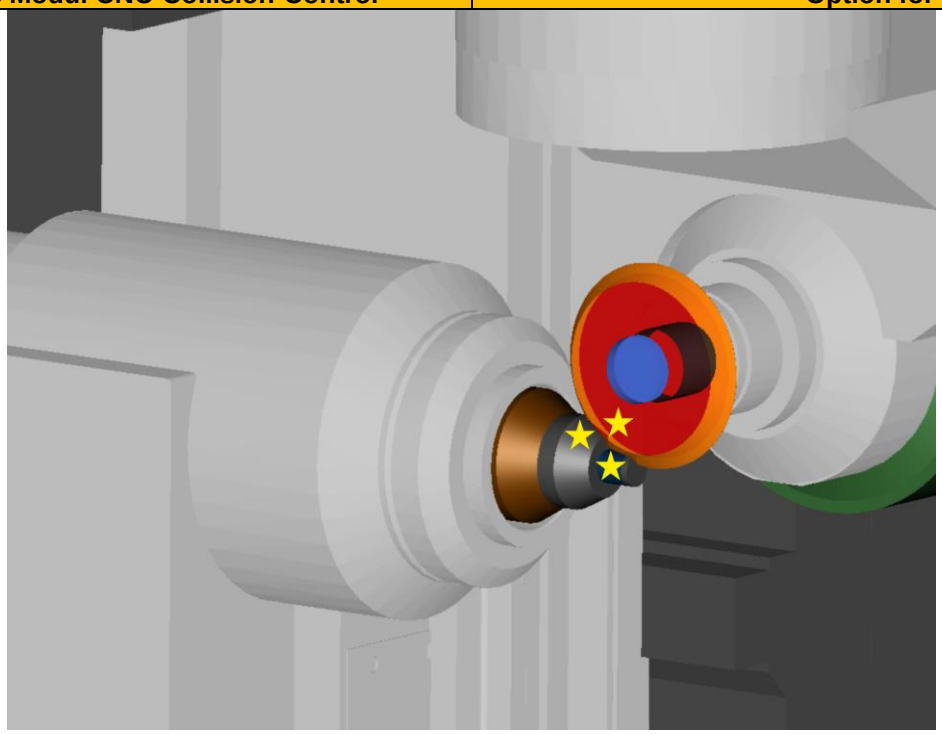


18.1 CAD Modul	
• CAD-Program specilized to the usage of tool-construction including interface to the grinding-modules.	

19.1 Dressing Cycle / Wheel Profile	Option
	
19.1 Dressing Cycle / Wheel Profile	
• **Wheel dressing:** • Input of dressing parameter within machine world • Calculation of dressing cycle driven by given wheel profile (Pos. 19)	

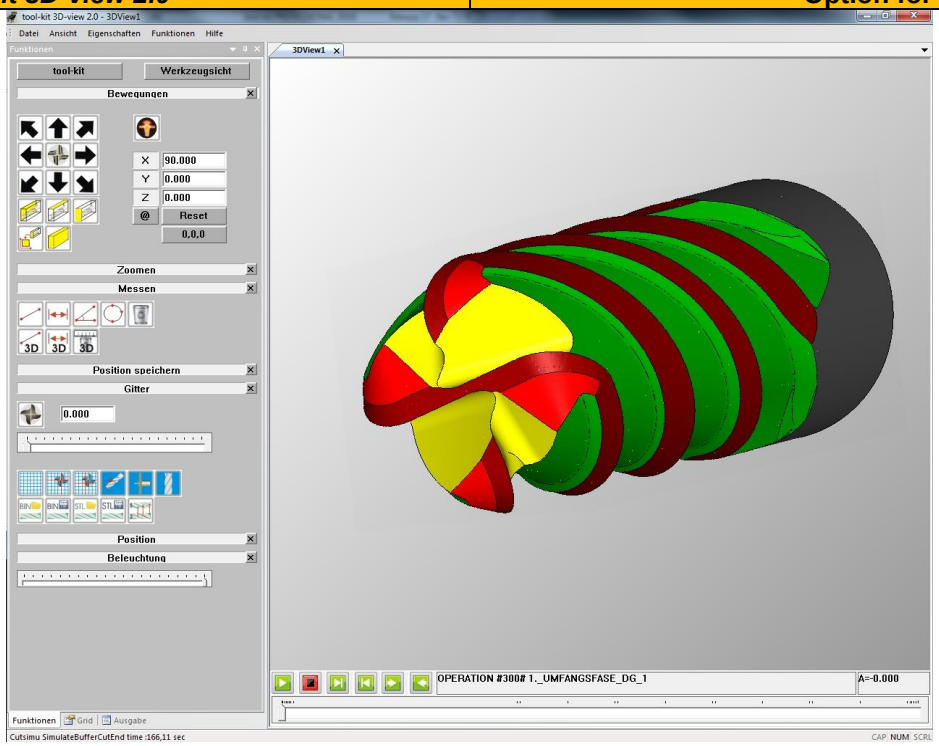
20.1 Open Procedure Genrerator	Option für alle Module
	
20.1 Open Procedure Genrerator Construction and generating of selfmade additional operations. Integration at any operation-position.	
• **Generating of open procedures**: • Graphical construction of open procedures • Up to 10 different additional operations per modul • Import/Export by global database • Inserting at any position within machining order • Seperate wheel and technology to each open procedure • Movement- and intersection-simulations	

21.1 Basic Modul CNC-Collision-Control	Option for all Moduls



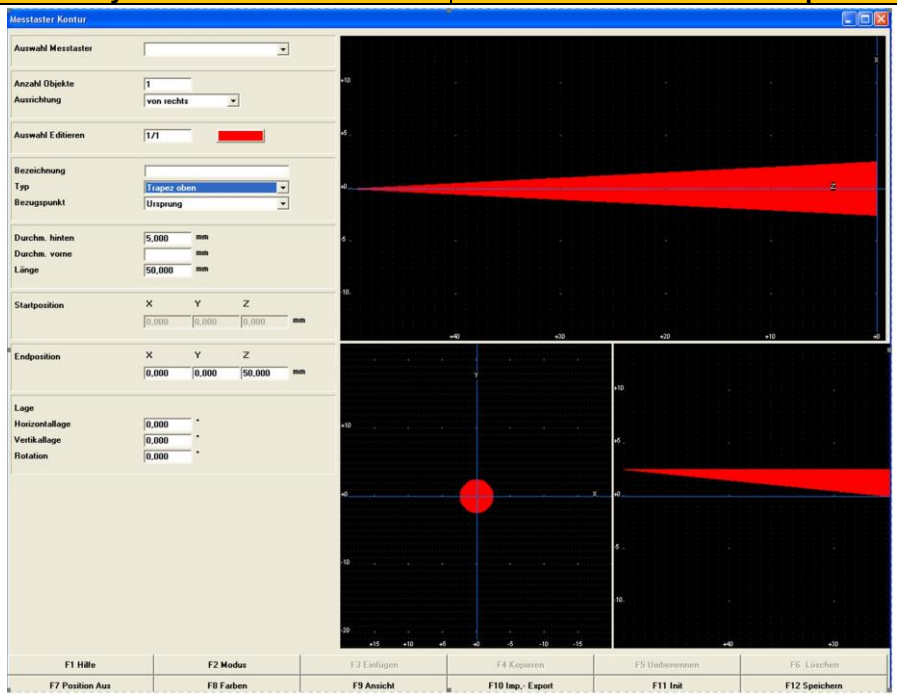
21.1 Basic Modul CNC-Collision-Control	
• **Functions:** NC_start without collision-control NC_start with collision-control and auto stop at first collision. NC_start with collision-control and collision protocoll of all situations NC_simulation without collision display NC_simulation with collision display • **Extended CNC-Generator:** Collision-control: Yes / No Mode-selection: „Stop at first collision“ / “All collisions“ • **Mode „Stop at first collision“:** The modul stops the calculation of the CNC-code by recognition of the 1st collision and shows these graphically on the scope • **Mode „All collisions“:** First the CNC code will be calculated completely. Subsequently we will have a listing of all collision situations. In the following these can be individually plotted and examined.	• **Administration of the collision objects (Setup):** 4 object lists: Basical objects, tool-objects, clamping- and spindle-objects. The list administration takes place in each case by inserting, copying, renaming or deleting. The selection of the objects which can be considered concerning the collision takes place via activating in the object lists. • **Collision calculation:** Examinating the penetration of all activated objects, as well as the active grinding wheel outside of the workpiece. Generating the collision protocol.

22.1 *tool-kit 3D-view 2.0*	**Option for all Moduls**



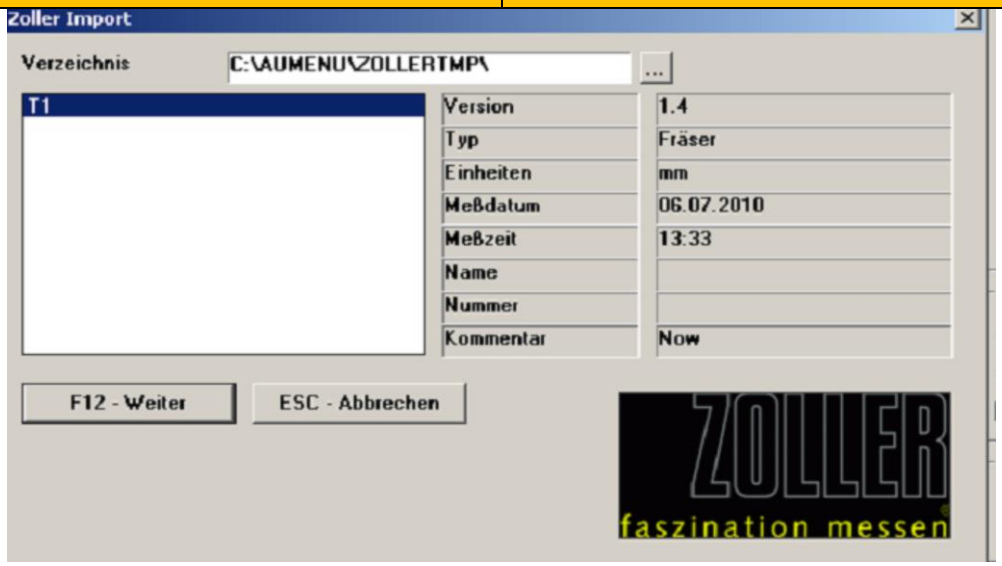
22.1 Basic Modul *tool-kit 3D-view 2.0*	
• **Tool-simulation in 3D** Integrated call of 3D-simulation from all moduls including 3D simulation view Positioning of the workpiece in three Rotary axes (3D view). Save 3D views. 2D grid and 2D measurement (distance, angle, radius). 3D measurement (points, distance). Section plane display Snap2Point feature. Refining function for cutouts. Transparency view Adding operations (not everything new count). Loading STL blanks. Save as STL file. Display of STEP files	

23.1 Measurement-Cycles	Option for all Moduls



23.1 Basic Modul Measurement-Cycles	
• **Measurement-Cycles for 3D-probing-system** Length Tooth-positioning Helix lead (zylindrical, conical) Diameter (zylindrical, conical) Teeth-indexing	

24.1 MTS-interface to an external Measurement-Machine	



24.1 MTS-interface to an external Measurement-Machine	
• Interface within tool-kit PROFESSIONAL to a measurement-maschine (Exp. Zoller genius 3). • Exchange of geometry data between MTS software and a measuring machine. • Measurement of workpiece data and wheel geometry • Reading back the measured datas • Decision for further processing.	• Measurement-data will be read and analysed by the error-handling-procedure. • The generated correction-data will be used in ordert to come to correct must values at next grinding step. • Correction Options: • **Correction on the wheel data:** Reasonable corrections f.e. at diameter, rake-angle and wheel-distance. • **Using the operation-specifical correction table:** Corrections at machine-data or wheel-data. • **Correction of tool parameter:** Correction in inverse direction to the actual value and setpoint.