Software-Moduls

Specifications

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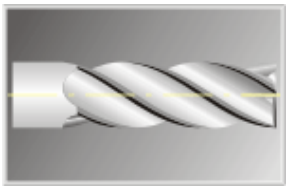
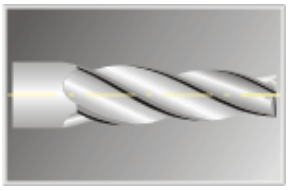
1 End Mills Specifications

1.1 Cylindrical and tapered standard end mills

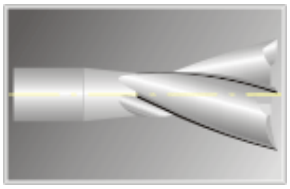
Work Piece:



Cylinder

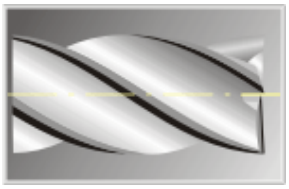


Taper

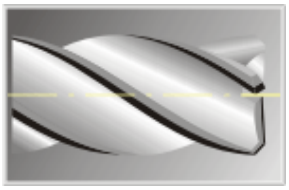


Angular Cutter

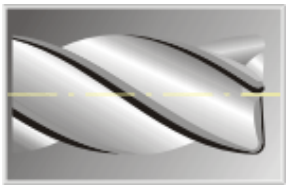
Tool End Face Geometry:



Plane



Chamfer



Corner Radius

Workpiece:
1. Cylinder
2. Taper
3. Angular Cutter

Point:
1. Plan Face
2. Chamfer
3. Corner Radius
4. Ball Nose
5. Circular Arc
6. Double Radius

Geometry:
1. Regulare
2. 2 at Center
3. 1 above Center
4. Centring Point

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

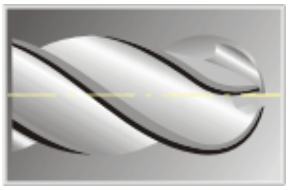
Production / Regrinding:
- Production by different infeed (several steps)
- Regrinding with calculation of removal length, periphery and rake.
- Regrinding, finishing with different wheels

Preparation
- Separating
- Profile roughing
- Profile finishing

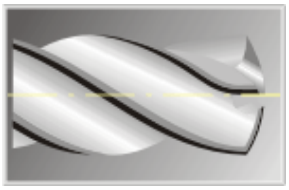
Main Fluting
- Meas. definition: Point-/ normal cut
- Grind direction: Forward / backward
- Optional spark out grinding
- **Taper**:
- Constant angle / constant helix
- Regrinding with undefined helix

Periphery
- Linear relief: 1st/ 2nd /3rd relief angle
- Radial relief: Cross-/ longitudinal
- Roughing
- Grind direction: Forward / backward
- Optional spark out grinding

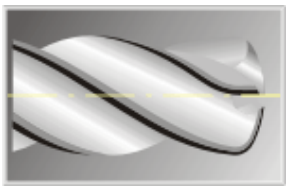
Tool End Face Geometry:



Ball Nose

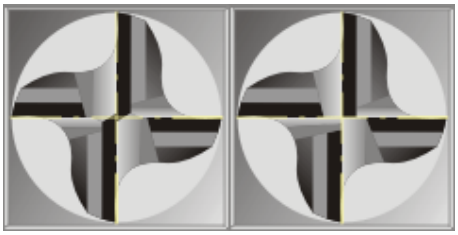


Circular Arc

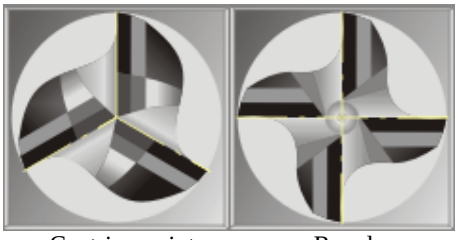


Double Radius

End Face Cutting Edge Geometry:



2 to center 1 above center



Centring point Regular

Heel
- Grind procedure: Crosswise-/ longitudinal
- Production by different infeed (several steps)
- Grind direction: Forward / backward
- Optional spark out grinding

End Face
- Linear relief grinding
- Hollow grinding

Chamfer Clearance/Chamfer
- Linear relief: 1st/ 2nd /3rd relief angle
- Grind. direction: Forward / backward
- Optional spark out grinding

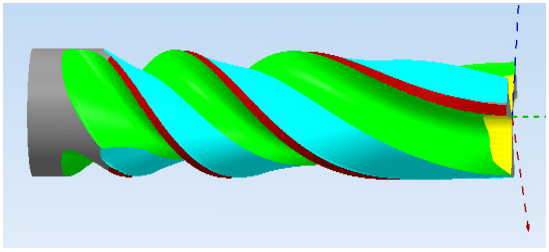
Gashing
- Grinding procedure: Recessing / Interpolation
- Radius at entry and exit
- Variable aperture angle

Notching
- Radius at entry and exit
- Variable entry- and aperture angle

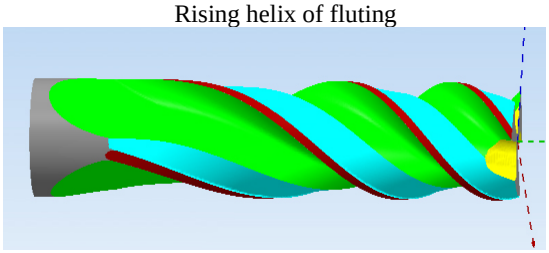
Profile Simulation
- Simulation of intersection at all operations
- Wheel/workpiece-simulation
- Machining simulation

Shank
- Reducing the shank diameter
- Clamping area

1.2 Variably Helix



Rising helix of fluting



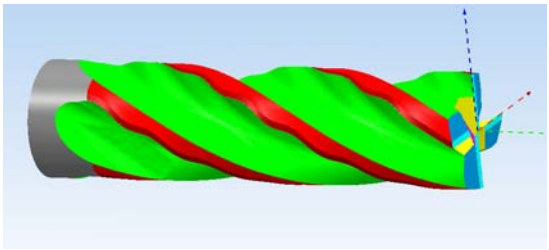
Falling helix of fluting

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

1.3 Wavecut



Wavecut

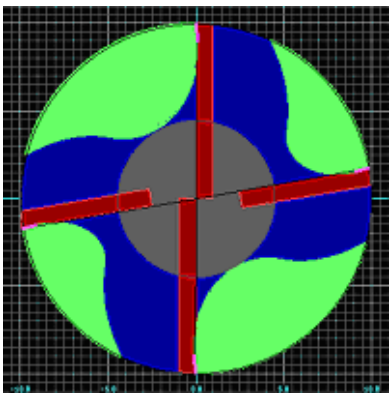
Extension to 1.1:

Wavecut:

- 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. Multi Cutter End Mills Specifications

2.1 Multi Cutter End Mills

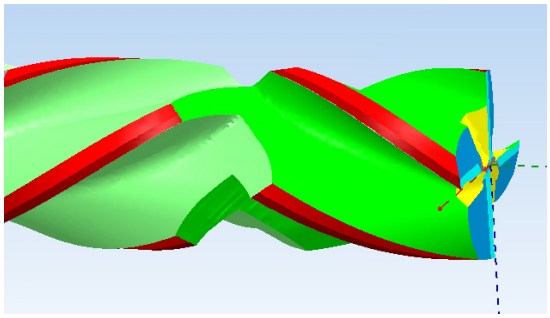


Specification:
- Cylindrical standard end mills
- 2 teeth at center: max. 8 teeths

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-End Mill)



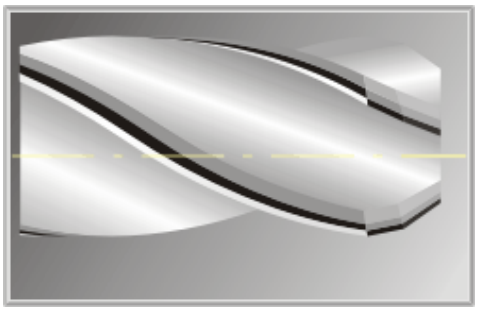
Up-Down-End Mill

Extension to 2.1:

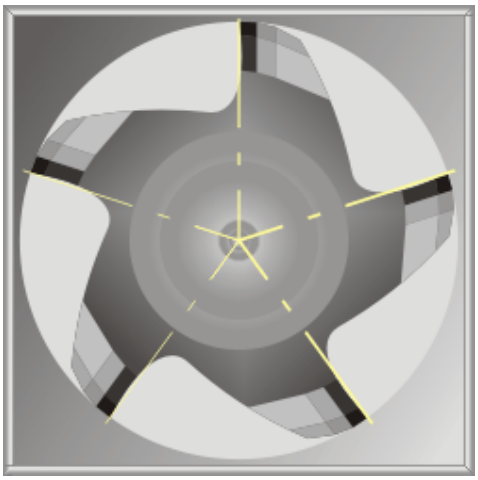
- 2, 3 or 4 teeth tools with two crosswise cutting edges for each tooth:
- Primary fluting: right helix
- Cross cutting: left helix
- Axial and radial tooth offset

3 Reamer Specifications

3.1 Reamer



Side view



Front view

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

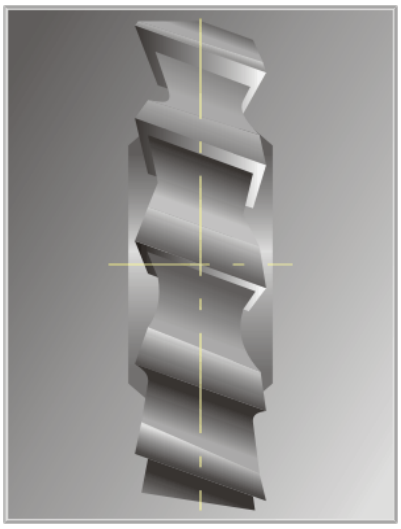
Periphery
- Like end mills Pos. 1.

Heel:
- Like end mills Pos. 1.

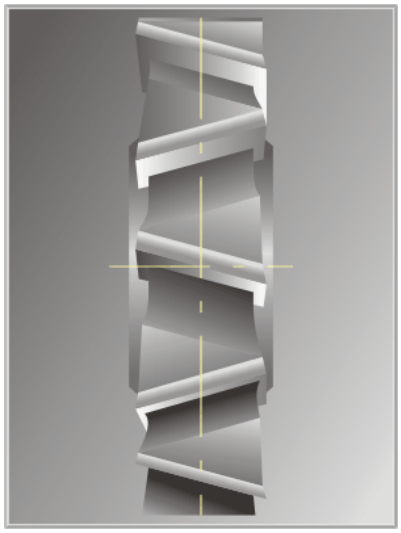
Chamfer
- Linear relief: 1./2./3. relief angle
- Radial relief: transverse/longitudinal

2nd Chamfer
- Optional: 2nd chamfer

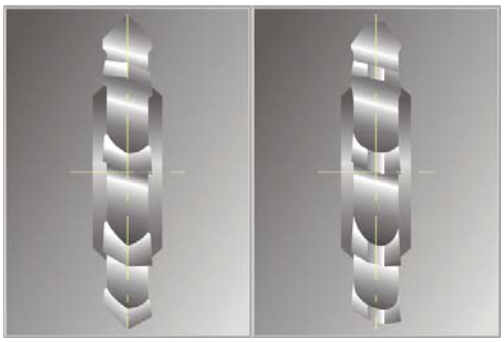
4. Side Milling Cutter **Specifications**



standard teeth



staggered teeth



Workpiece:

1. Cylinder
2. Trapecoid
3. Prisma
4. Half Angle
5. Full Radius

End Faces:

1. Plan Face
2. Chamfer
3. 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:

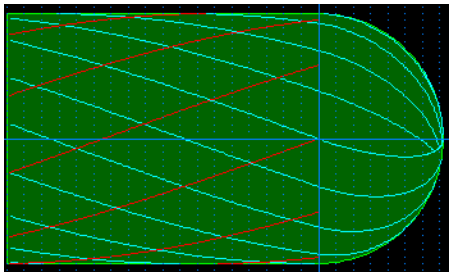
- like end mills

Chamfer front/rear:

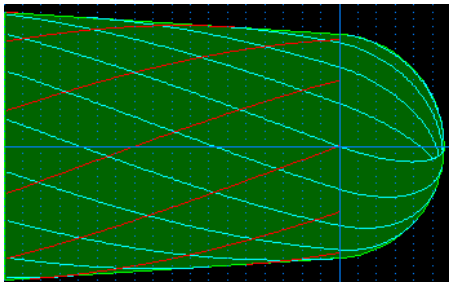
- like end mills

5 Burs/Dental-tools **Specifications**

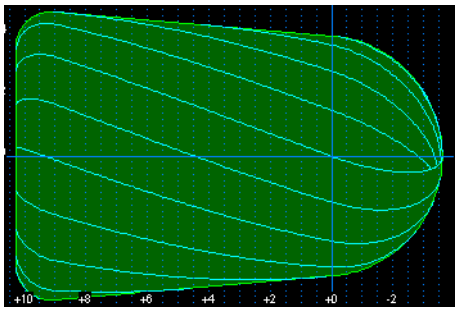
Front section: Exp. Ball Nose



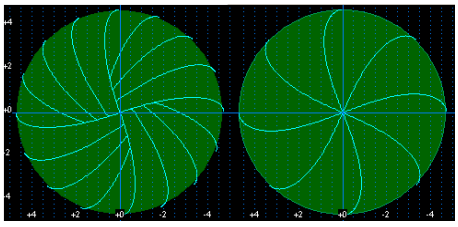
Middle section: Exp. Front Taper



Back section: Exp. Radius



Standard Fluting: Cut to Center / Groove Cut



Profile Construction:
Free selectable sequence including:

Front:
1. End face
2. Point
3. Chamfer
4. Sphere
5. Ball nose
6. Enlarged radius
7. Double radius

Middle:
1. Cylinder
2. Increasing taper
3. Downgrade taper
4. Convex radius
5. Concav radius

Back:
1. Cylinder
2. Taper
3. Radius

Standard Fluting:
- Cut to center
- Section fluting
- Two to center
- Groove cut

Double Cutting:
- Optional

Periphery:
- Optional

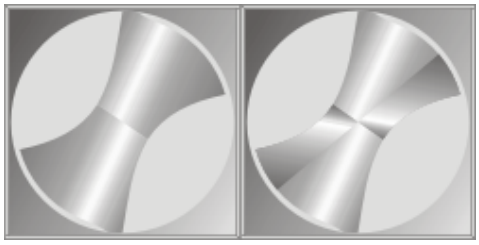
Chip breaker:
- Optional

Grinding Direction:
- Forward
- Backward
- Bidirectional

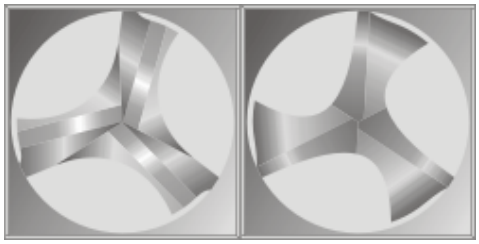
6 Drills — Specifications

6.1 Standard Drills

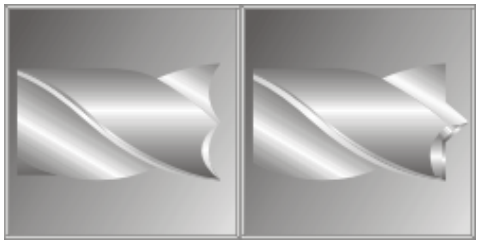
right helix/ right cutting
left helix/ left cutting work pieces



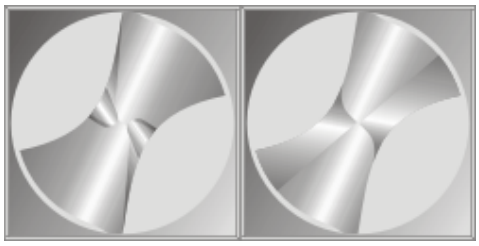
Standard — Split point



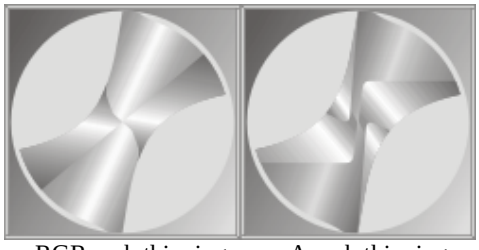
2-,4-,6- facet point — M-point



Kevlar point — Centring point



corr. main cutting edge/ corr. chisel edge — S-web thinning



RGR-web thinning — A-web thinning

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

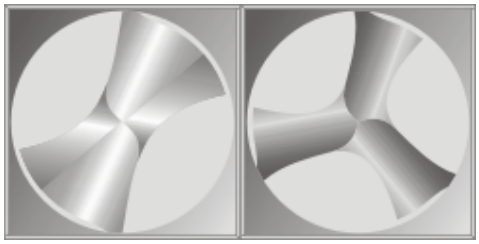
Periphery
- Radial grinding / Round grinding
- Transverse/longitudinal positioning
- Linear relief: 1./2. relief angle

 5-steping drill	**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 **Simulation** - Simulation of intersection at all operations - Wheel/workpiece-simulation - Machining simulation **Production from standard- to step drill** - Special measurement and calculation program

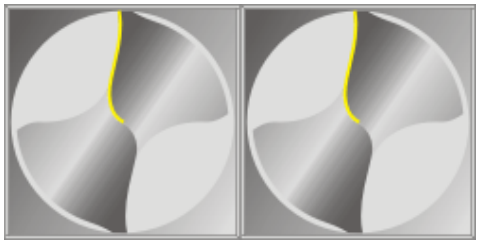
6.2 Subland Drills

	**Extension to 6.1:** **Specification according to Standard-/Stepping Drills** **Secondary Fluting** - Defined rotation against main fluting

6.3 S-Point

 2-Teeth 3-Teeth	**Extension to 6.1:** **S-point like Hertel** - 2 and 3 teeth

6.4 Chamfering Web Thinning

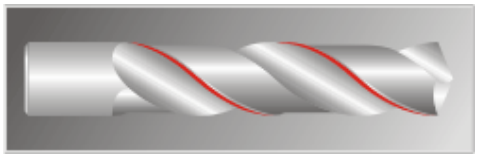


Chamfer of S- and RGR-Web Thinning

Extension to 6.1:

Chamfering at cutting edge of S- and RGR-Web Thinning

6.5 Chamfering of the flute cutting edge



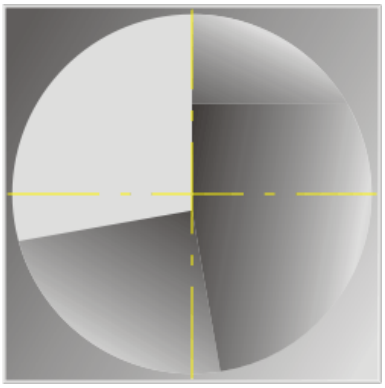
Chamfer of the flute cut

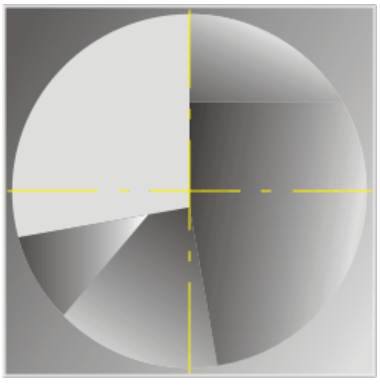
Extension to 6.1:

Chamfering at cutting edge of flute:

- Chamfer Angle
- Chamfer Width

7 Deep Hole Drill Specifications





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

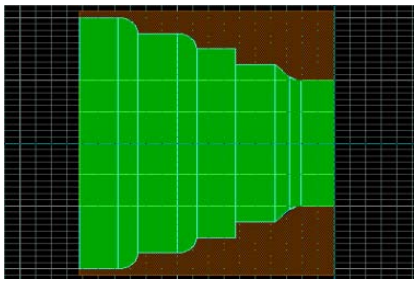
8 Profile Tools — Specifications

8.1 Basic program „Increasing / Downgrade Profile“

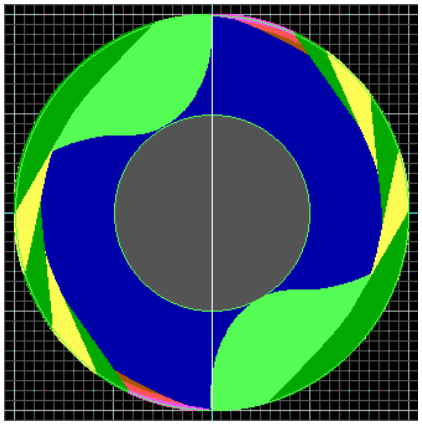
Profile End Mills / Spade End Mills

Profile Drills / Spade Drills

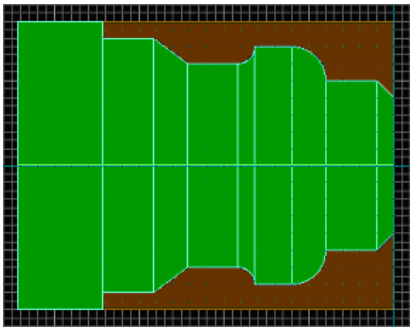
right helix / right cutting
left helix / left cutting



Side view



Front view



side view

Workpiece:
- Tools with increasing and **falling** profile

Point:
A) Milling End Face like 1.1
B) Drills Point like 6.1

Geometry:
A) Milling End Face like 1.1
B) 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

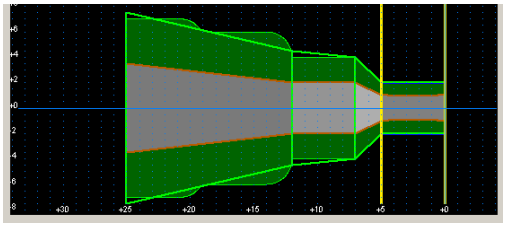
Profile Element:
- Straight line
- Edge
- Convex / concave radius
- Chamfer
- Increasing / downgrade profile
- Free selectable sequence of the profile elements

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

8.2 Extension: Multi Fluting Geometry



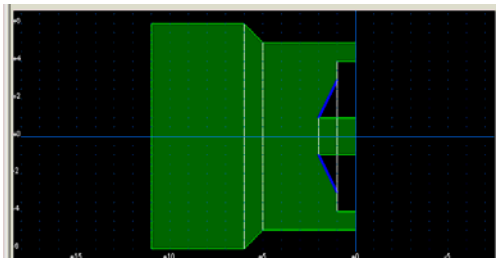
Workpiece with 4 flutings

Extension of basic program:

„Multi Fluting Geometry“

- Up to 5 flutings with separate definition but common cutting edge

8.3 Extension: Receding Profile



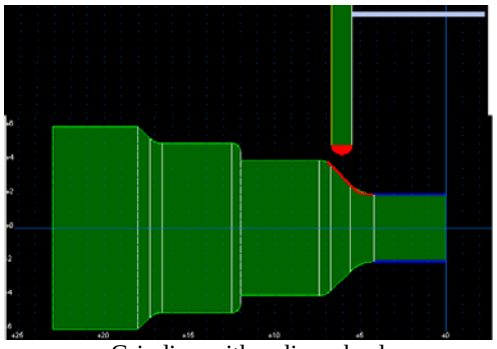
Workpiece with „Receding Profile“

Extension of basic program:

„Receding Profile“:

- Extension of profile including receding sections

8.4 Extension: Radial Periphery



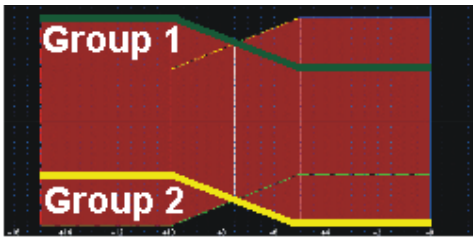
Grinding with radius wheel

Extension of basic program:

„Radial Periphery“:

- Radial periphery along discretionary sections
- Special grinding procedure by radius wheel

8.5 Extension: Multi Cutting Geometry

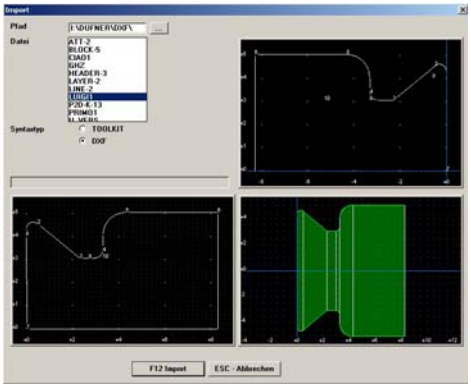


Extension of basic program:

„Multi Cutting Geometry“:

- Multi cutting tools with 2 Groups
- In pairs different cut geometry

8.6 Extension: Reading DXF-Format

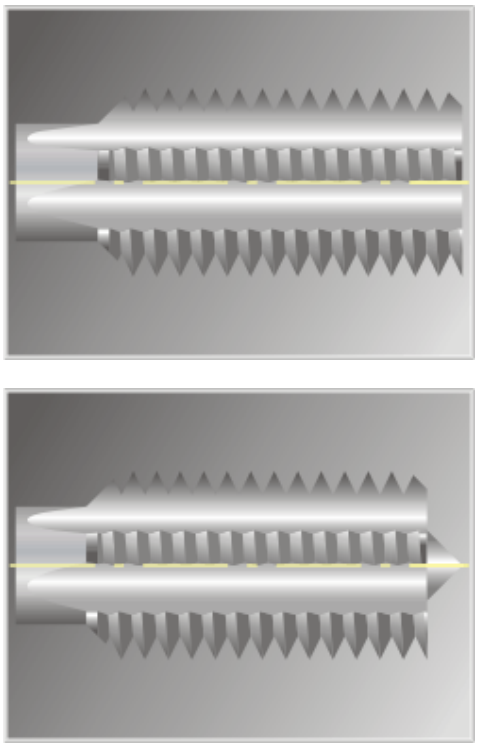


Extension of basic program:

- 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“

9 Taps — Specifications

9.1 Taps, Basic



Taps with flatgrind or centring point

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

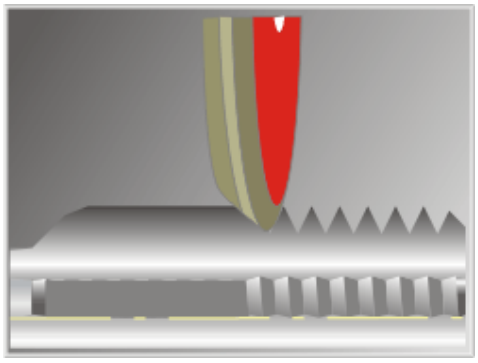
Preparation:
- Separation
- Profile roughing
- Profile finishing

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 / Production



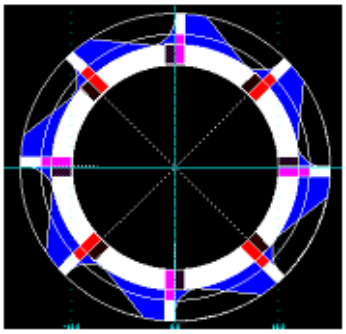
Extension to 9.1:

Tap production:
- Production by profile-wheel (Wheel-defintion by DXF- or point discription)
- Radial relief

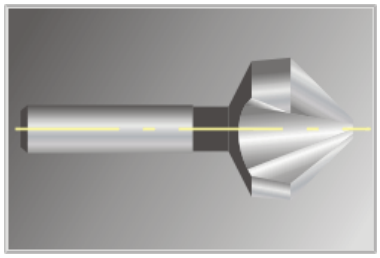
10 Dies **Specifications**

	Rake Angle Wole: - Production with mounted point grindings - Rake angle, front and rear **Thread:** - Machining by profile-wheels - Separate operation for flank and head relief - Management of DIN-table **Chamfer:** - Type of grinding: transverse by 1A1 - Chamfer angle - Chamfer length - Chamfer radial relief **Preparation:** - Outer and inner diameter - Chamferings

11 Core Drills **Specifications**

	**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

12 Countersink **Specifications**



Counter flute with special grinding procedure

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

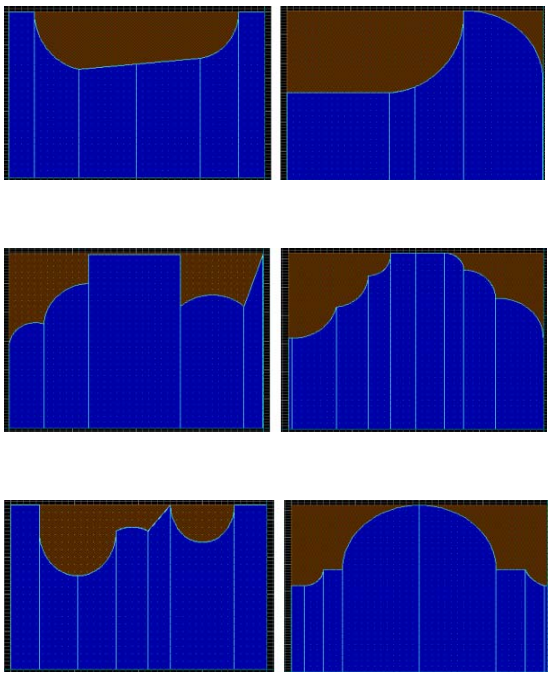
Chamfer:
- Axial/radial relief angle

Rear Section:
- Cylindrical grinding

Plane End Face

13 Profile Cutter **Specifications**

6 Examples:



Workpiece:
- Tools with free selectable profile

Profile:
- CAD-System for profile construction

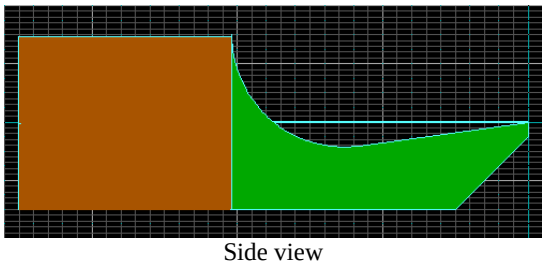
Profile Element:
- Straight line
- Edge
- Convex / concave radius
- Chamfer
- Free selectable sequence of the profile elements

Preparation:
- Profile roughing
- Profile finishing

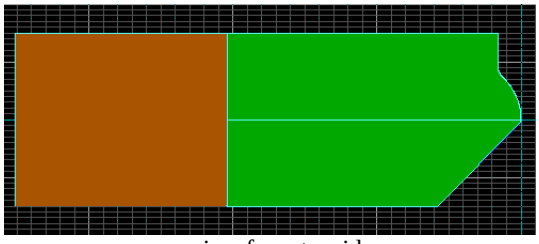
Lateral Clamping:
- Straight
- Helix
- Rake angle

Periphery:
- Axial part of relief
- Radial part of relief
- Free selectable grinding position per element

14 Burins / Lathe Tools **Specifications**



Side view



view from topside

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

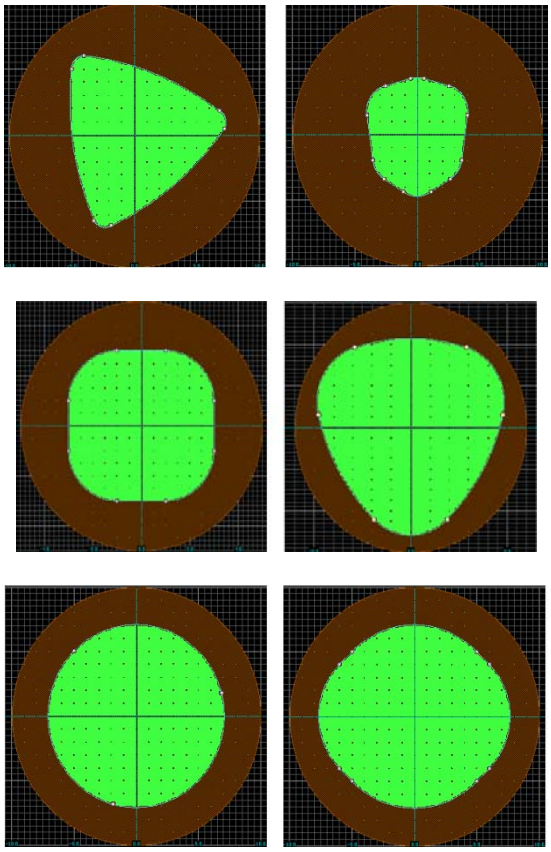
Clamping:
- Frontal

Periphery:
- Axial part of relief
- Radial part of relief
- Free selectable grinding position per element

Main Fluting:
- Straight fluting
- Sec. gashing

15 Punches **Specifications**

6 Examples:

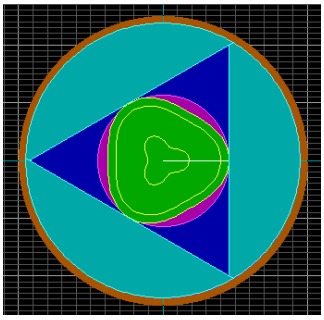


Workpiece:
- Round grinding with free selectable profile

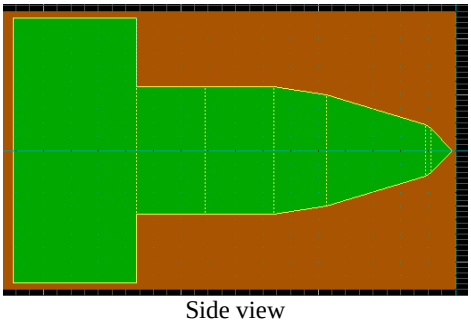
Profile:
- Cross simulation construction by CAD
- 2-, 3-, 4-fold symmetrical convex forms

Machining:
- Profile roughing
- Profile finishing
- Profile polishing

16 Flow Drills **Specifications**



Front view



Side view

Workpiece:

- Round grinding with free selectable profile

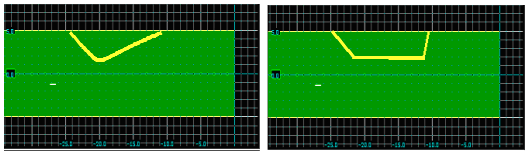
Profile:

- Cross simulation construction by CAD polygon forms

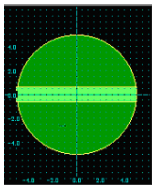
Machining:

- Profile roughing
- Profile finishing
- Profile polishing

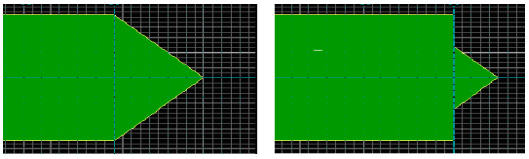
17 Preparation / Profile Processing **Specification**



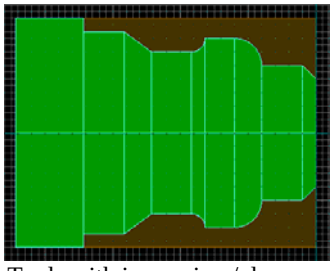
Exp: Clamping Surface Form E_2 / Form B, 1Land



Slog



Full Point / Centring Point



Example: Tools with increasing / downgrade profile

A) 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

B) Profile Machining
- Increasing / downgrade profiles

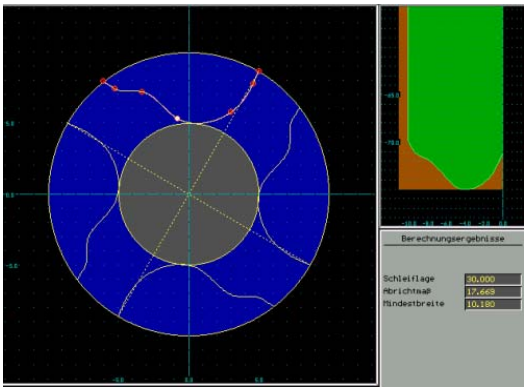
Operations
- Roughing
- Finishing
- Polishing

Type of End Face:
- Plane
- Point
- Centering point

18 Construction of Flute Profile / Wheel Profile Specification

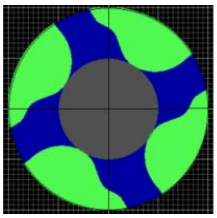
18.1 Construction of Flute Profile / Wheel Profile

with profile-wheels

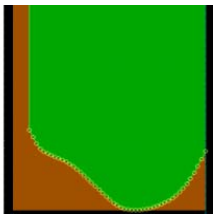


Flute construction calculation

Wheel



Simulation

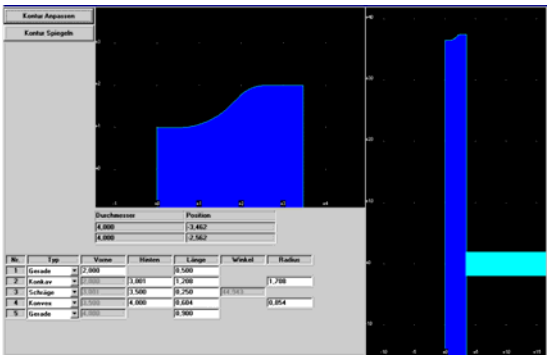


Dressing

Construction of Flute Profile:

- Construction by integr. CAD
- Calculation of wheel-profile
- Calculation of grinding track
- Intersection simulation
- Output of wheel discription

19. Construction of Wheel Profile / Flute Calculation Specification



Wheel Construction

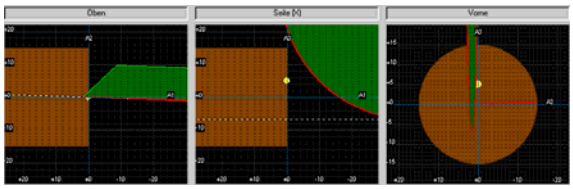
Construction of the Wheel Profil:

- Input by DXF-interface or geometrically discription
- Construction by integrated CAD
- Calculation of fluting
- Simulation of fluting
- Output of flute positioning

20 Dressing cycle / Wheel profile **Specification**

	Wheel dressing: - Input of dressing parameter within machine world - Calculation of dressing cycle driven by given wheel profile (Pos. 19)

21. Open Procedure Generator **for all moduls**

Construction and generating of selfmade additional operations. Integration at any operation-position.  Graphical construction of movements	**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

22 CNC-Collision-Control **Specification**

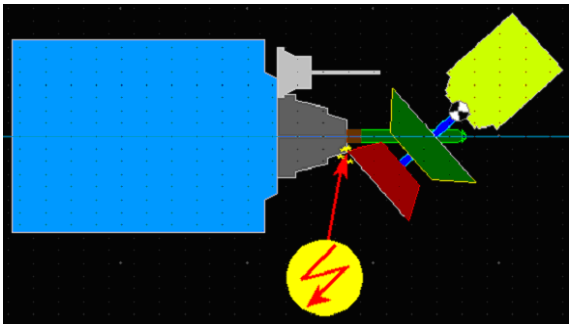


Diagram of a collision of the grinding wheel with the clamping.

.

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.

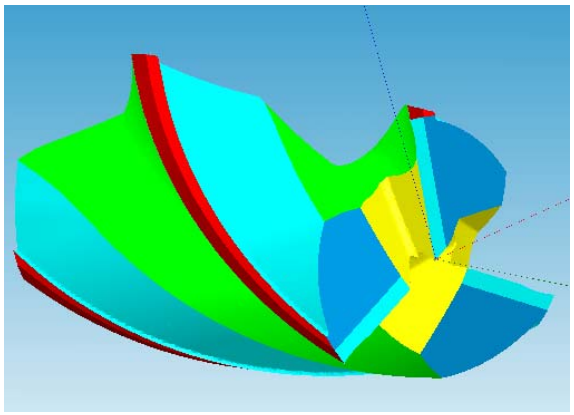
Mode „All collisions“:
First the CNC code will be calculated completely. Subsequently we will have a listing of all collision situations.
In the following these can be individually plotted and examined.

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.

23. 3D-Simulation

23.1 3D-Simulation Workpiece / Wheel

	**Tool-simulation in 3D:** - Integrated call of 3D-simulation from all moduls - Selecting of operations to simulate - Different dissolutions - Free online rotating, relocating and enlarging of the tool

23.2 MTS- interface for 3D-workpiece-simulation

	Interface within tool-kit PROFESSIONAL to 3D-workpiece-simulation: - „Vericut“ - „SolidPro“ by system V&

23.3 3D- machine -simulation

	Simulation of the machining process by 3D-simulation

23.4 MTS-interface for 3D-machine-simulation

	Interface within tool-kit PROFESSIONAL to 3D-maschining-simulation: - „SolidPro“ by system V&

23.5 3D-Wheel-Simulation

	Simulation of the wheel database by 3D-simulation

23.6 MTS-interface for 3D-wheel-simulation

	Interface within tool-kit PROFESSIONAL to 3D-maschining-simulation: - „SolidPro“ by system V&

24. Measurement-Cycles

24.1 Measurement-Cycles (to all MTS-moduls)

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

25. Measurement-Machine

25.1 MTS-interface to an external Measurement-Machine

	Interface within tool-kit PROFESSIONAL to a measurement-maschine (Exp. Zoller genius 3). The machine will be setted by the geometry-data out of tool-kit PROFESSIONAL. Measurement of tool-data and wheel-geometry.