Technical description

CNC GRINDING WITH 325LINEAR SERIES
Technical description

TABLE OF CONTENTS

- Milling cutters ......................................................................................................................... page 4
- Drilling tools ............................................................................................................................. page 7
- Extensions for milling cutters and drilling tools ....................................................................... page 11
- Extension for clamping system transformation ....................................................................... page 13
- Gear cutting tools ................................................................................................................. page 14
- Further options ....................................................................................................................... page 15
- Simulation software .............................................................................................................. page 16
- Documentation ....................................................................................................................... page 18
- Assignment to order numbers of company NUM ................................................................... page 19
MILLING CUTTERS

N100: Simple milling cutters
- Body form: parallel and tapered
- Face form: flat, full radius, corner radius, chamfer
- Helix: right-hand helix/right-hand cutting, left-hand helix/left-hand cutting
- Body clearance

This option is designed for re-sharpening of simple cutters.

N110: Extension for complex milling cutters
This option demands item N° N100.
- Right-hand helix / left-hand cutting
- Left-hand helix / right-hand cutting
- Differential helix
- Supplementary flutes
- Manual flutes
- Manual tip reliefs
- Separate division
- Separate helix programming
- Cylinder relief up to 10 variants
- Manual grinding path
- Radial reliefs
- Gash out rounding
- S-cutting edge in ball center
- Radius modification

N120: Multi helix
This option demands item N° N110.
Only for cylindrical milling cutters with up to 12 different helix angles.

N150: Form cutters
Body form: form defined by a DXF file
Face form: flat
N160: Saw cutters
This option demands item N° N110.

N170: Burrs
- Cylinder or taper, optional with ball nose
- Convex body (one radius)
- Convex body with ball nose (two radii)
- Sphere
- DXF-Contour (limited feasibility depending on the wheel)
- Grouped teeth for burrs (up to 20 different groups)

N180: Extension for wave grinding in production mode
This option demands item N° N110.
Remark: In the field of wave grinding there is a patent pending. It is the responsibility of the machine manufacturer respectively the end user to clarify the patent situation regarding the planned use of this option.

N190: Extension for wave grinding in resharpening mode
This option demands item N° N110.
Includes the probing of the cutting edge and resharpening of the reliefs along the wave cut.

DRILLS
N200: Simple drills
- Points: spiral point, 4-facet, S4, S6, T3
- Flute and clearance operation
- Up to 3 diameters
- Straight step transitions with programmable angle
N210: Extension for complex drills
This option demands item N°209.
- Points: break point, end mill tip, KM3, KM-V
- Up to 10 diameters
- Length with taper on each step programmable
- K-land along the flute
- Swivel flute
- Step face clearance

N211: Cutting edge correction
N212: Flute form adaptation
N213: Programmed core
N214: Separate division
N215: Separate helix programming
N216: Cylinder relief up to 10 variants
N217: Manual grinding path
N218: Chip breaker on drill point
N219: Scalping cut (tap)
N220: Countersink

N214: Extension for Kennametal-points: SE/TF
This option demands item N° N200.

N215: Extension for Kennametal-point: HP
This option demands item N° N200.
Approval by Kennametal necessary.

N216: Extension for Klenk-points.
(WEGANIT, WEGATIN, WEGABLU, POLLUX)
This option demands item N° N200.
Approval by Klenk company necessary.

N217: Extension for Gühring-point: RT 100 R
This option demands item N° N200.
Approval by Gühring necessary.

TECHNICAL DESCRIPTION

NUMROTO – TOTAL SOLUTION FOR TOOL GRINDING

EXTENSIONS FOR MILLING CUTTERS AND DRILLING TOOLS

N300: Extension for cylindrical grinding
This option demands item N° N100, N200 or N150. A work spindle which supports continuous rotation for cylindrical grinding is necessary for this version.

N340: Extension for form steps
This option demands item N° N200. Defined by DXF files.

N550: Special Grinding Functions
For this option at least one of the following articles is needed: N150, N110 or N210. This add-on option includes the following functions:

- Overlapping of a sine wave movement in order to modify the diameter (polygon modification) for the following operations: Flutes (only in form cutter module), manual step face cam, manual grinding path, plunge grinding (only in form cutter module)
  Possible applications: flow drills, add-on operations for forming taps.
- Grinding operation: manual profile grinding path: Grinding of a profile which can be defined on a plane
  Grinding procedure: peripheral grinding in form direction
  Possible application: Grinding of seats for inserts
- Automatic orientation of the grinding point at 12 o'clock for the manual flute when using shape wheels.
  Can only be used in drill module.
- Correction profile for form cutters and form steps
- Multi angle point
- Independent flute
- Independent manual flute
- Variable helix for burrs
- Variable gash-out angle for drill S-gash-out
- Flute-X
- Gash-Out X

N220: Extension for differential helix
This option demands item N° N210. Variable helix angle over a given length of the cutting section. For step drills, limited use only.

N240: Extension for K-Land on drills points
This option demands item N° N200. Feasibility depending on drill point type.

N250: Extension for gun drill points
This option demands item N° N200.

N260: Extension for forming taps
This option demands item N° N150. Modulation of diameter according to NUMROTO calculations. (customer specific adaptation possible)
N265: Extension for rough profile
This option demands item N° N100.

CLAMPING SYSTEM TRANSFORMATION

N400: Extension for clamping system transformation
This option demands item N° N150.

Feasibility limited depending on machine layout and clamping system. Probing of tool location not possible.
GEAR CUTTING TOOLS

N500: Hob resharpening
Resharpening of hobs in the flute.
The following operations are available:
• Flute
• Manual flute
• K-Land along the flute (additional flute operation)
In order to get a straight rake face on helical hobs a specially calculated and dressed grinding wheel might be needed. The calculation of such a grinding wheel and the dressing is not included in this module.

N530: Extension for shaper cutters. Grinding of tip.
This package permits the regrinding of the rake surface of shaper cutters either in the form of conical grinding or a step cut.

SUPPLEMENTARY FUNCTIONS

N700: Automatic tool measurement using a probe.
For milling cutters, drills/step drills and form cutters.

N710: Automatic wheel measurement using a probe
For peripheral and cup wheels, diameter and flange dimension.

N720: In-process measurement
This option demands item N° N700.
Measurement of ground diameter immediately after the according operation is finished. Available for several operations. Detailed information upon request.
After measurement automatic compensation and repetition of the operation if needed.

N730: Wheel profile determination
Wheel profile determination based on a given flute profile.
( DXF-format or text file with polygon points)

N740: Wheel dressing
Using a dressing disk, according to NUMROTO specifications.

N750: Sticking grinding wheels
Using a sticking unit according to NUMROTO specifications.
SIMULATION SOFTWARE

N900: Tool simulation with animation of the grinding process (material removal)
Calculation of a 3D model from the programmed tool.
Material removal simulated step by step.

N910: Collision checking with 3D machine simulation
Collision checking between all defined machine parts and the grinding wheels. Collision checking between grinding wheels which are not used and the blank.
Animation of machine movements based on the calculated CNC file (without generation of a 3D tool model, no material removal).

N920: 3D Special functions
Several additional functions for the 3D tool simulation:
- Determination of the value QW' (specific material removal rate)
- Display of the center of gravity
- Export of 3D model as 2D and 3D DXF lines
- Automatic monitoring of removal rate during 3D collision check
- Real time simulation
- STL comparison
- Stereo-3D display

N930: 3D-online simulation
This option demands item N° N910.
Adds the possibility to show the current position of the machine in the 3D simulation as long as there is an active connection between the computer and the control.
Minimal software revision on CNC: L1
Lag time (real time performance) between machine movements and display on the computer depends on the interface which is used to connect the PC to the CNC.
The TCP/IP interface is highly recommended.
DOKUMENTATION

NR40: NUMROTO-Draw
Program to generate automatically a drawing (front view) for end mills, drills, step drills and form cutters.

ASSIGNMENT TO ORDER NUMBERS OF COMPANY NUM

<table>
<thead>
<tr>
<th>Schütte No.</th>
<th>NUM No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N100</td>
<td>CH-5002350</td>
<td>Simple milling cutters</td>
</tr>
<tr>
<td>N110</td>
<td>CH-5002360</td>
<td>Extension for complex milling cutters</td>
</tr>
<tr>
<td>N120</td>
<td>CH-5002330</td>
<td>Extension for multi-helix</td>
</tr>
<tr>
<td>N150</td>
<td>CH-5002350</td>
<td>For form cutters</td>
</tr>
<tr>
<td>N160</td>
<td>CH-5002350</td>
<td>Extension for saw cutters</td>
</tr>
<tr>
<td>N170</td>
<td>CH-5002300</td>
<td>Burrs</td>
</tr>
<tr>
<td>N180</td>
<td>CH-5002390</td>
<td>Extension for wave grinding in production mode</td>
</tr>
<tr>
<td>N190</td>
<td>CH-5002370</td>
<td>Extension for wave grinding in resharpening mode</td>
</tr>
<tr>
<td>N200</td>
<td>CH-5002370</td>
<td>Simple drills/step drills</td>
</tr>
<tr>
<td>N210</td>
<td>CH-5002380</td>
<td>Extension for complex drills/step drills</td>
</tr>
<tr>
<td>N214</td>
<td>CH-5002590</td>
<td>Extension for Kennametal-points: SE/TF</td>
</tr>
<tr>
<td>N215</td>
<td>CH-5002490</td>
<td>Extension for Kennametal-point: HP</td>
</tr>
<tr>
<td>N216</td>
<td>CH-5002470</td>
<td>Extension for Klein-points</td>
</tr>
<tr>
<td>N217</td>
<td>CH-5002700</td>
<td>Extension for Gühring-point: HT 100 X</td>
</tr>
<tr>
<td>N220</td>
<td>CH-5002440</td>
<td>Extension for differential helix</td>
</tr>
<tr>
<td>N240</td>
<td>CH-5002460</td>
<td>Extension for K-Land on drill points</td>
</tr>
<tr>
<td>N250</td>
<td>CH-5002320</td>
<td>Extension for gun drill points</td>
</tr>
<tr>
<td>N260</td>
<td>CH-5002680</td>
<td>Extension for forming taps</td>
</tr>
<tr>
<td>N265</td>
<td>CH-5002345</td>
<td>Extension for rough profile</td>
</tr>
<tr>
<td>N290</td>
<td>CH-5002300</td>
<td>Extension for cylindrical grinding</td>
</tr>
<tr>
<td>N340</td>
<td>CH-5002500</td>
<td>Extension for form steps</td>
</tr>
<tr>
<td>N410</td>
<td>CH-5002780</td>
<td>3-axis oscillation for form relief grinding</td>
</tr>
<tr>
<td>N500</td>
<td>CH-5002390</td>
<td>Hob resharpening</td>
</tr>
<tr>
<td>N510</td>
<td>CH-5002380</td>
<td>Interface for external calculation</td>
</tr>
<tr>
<td>N530</td>
<td>CH-5002330</td>
<td>Extension for shaper cutters</td>
</tr>
<tr>
<td>N550</td>
<td>CH-5002480</td>
<td>Special Grinding Functions</td>
</tr>
<tr>
<td>N700</td>
<td>CH-5002310</td>
<td>Automatic tool measurement using a probe</td>
</tr>
<tr>
<td>N710</td>
<td>CH-5002390</td>
<td>Automatic wheel measurement using a probe</td>
</tr>
<tr>
<td>N720</td>
<td>CH-5002690</td>
<td>Extension for in-process measurement</td>
</tr>
<tr>
<td>N730</td>
<td>CH-5002310</td>
<td>Wheel profile determination</td>
</tr>
<tr>
<td>N740</td>
<td>CH-5002250</td>
<td>Extension for wheel dressing</td>
</tr>
<tr>
<td>N750</td>
<td>CH-5002370</td>
<td>Extension for stocking grinding wheels</td>
</tr>
<tr>
<td>N760</td>
<td>CH-5002355</td>
<td>Data interface</td>
</tr>
<tr>
<td>N800</td>
<td>CH-5002201</td>
<td>Machine license fee incl. 1 hardlock</td>
</tr>
<tr>
<td>N810</td>
<td>CH-5002515</td>
<td>License fee, multi-user extension</td>
</tr>
<tr>
<td>N900</td>
<td>CH-5002470</td>
<td>3D - Tool simulation with animation of the grinding process (material removal)</td>
</tr>
<tr>
<td>N910</td>
<td>CH-5002460</td>
<td>3D - Collision checking with 3D machine simulation</td>
</tr>
<tr>
<td>N920</td>
<td>CH-5002720</td>
<td>3D - Special functions</td>
</tr>
<tr>
<td>N930</td>
<td>CH-5002710</td>
<td>3D online simulation</td>
</tr>
<tr>
<td>N940</td>
<td>CH-5002740</td>
<td>NUMROTO-Draw</td>
</tr>
<tr>
<td>N950</td>
<td>CH-5002320</td>
<td>NUMROTO-Control (loader functions)</td>
</tr>
<tr>
<td>N960</td>
<td>CH-5004551</td>
<td>Additional hardlock for a further programming station without CNC code output</td>
</tr>
<tr>
<td>N961</td>
<td>CH-5004558</td>
<td>10 additional hardlock for a further programming station without CNC code output</td>
</tr>
<tr>
<td>N962</td>
<td>CH-5004552</td>
<td>Replacement hardlock</td>
</tr>
<tr>
<td>N963</td>
<td>CH-5004561</td>
<td>Hardlock with time limit</td>
</tr>
<tr>
<td>N964</td>
<td>CH-5004562</td>
<td>Extension of hardlock with time limit (repeated programming)</td>
</tr>
<tr>
<td>N965</td>
<td>CH-5004560</td>
<td>Replacement of an existing software package on CD</td>
</tr>
<tr>
<td>N970</td>
<td>CH-5002320</td>
<td>Windows operator screen for display and control</td>
</tr>
<tr>
<td>N990</td>
<td>CH-5004559</td>
<td>Express delivery surcharge</td>
</tr>
</tbody>
</table>