



HEIDENHAIN



NC-Solutions

Description of NC program 6040

English (en)
6/2018

1 Description of NC program 6040_en.h

Output format of NC programs

You can define in the post processor how you output an NC program.

You can output the NC program in the following ways:

- HEIDENHAIN Klartext format
- DIN/ISO programming
- Splines
- Vectors

Output in HEIDENHAIN Klartext format

If you output the NC program in Klartext format you have the following options:

- Output with three axes
- Output with up to five axes, without **M128** or **TCPM**
- Output with up to five axes, with **M128** or **TCPM**

If the kinematics of the machine and tool data are made available to the CAM system, it is possible to output NC programs with five axes without **M128** or **TCPM**.

An NC program with **M128** or **TCPM** is more flexible because calculation of the kinematics is performed on the machine and the tool data from the tool table are used.

Example

L X+88 Y+23.5 Z-8.3 R0 F5000	3-axis
L X+88 Y+23.5 Z-8.3 A+1.5 C+45 R0 F5000	5-axis without M128
L X+88 Y+23.5 Z-8.3 A+1.5 C+45 R0 F5000 M128	5-axis with M128

Output with vectors

From the point of view of physics and geometry a vector is a directed variable that specifies direction and length.

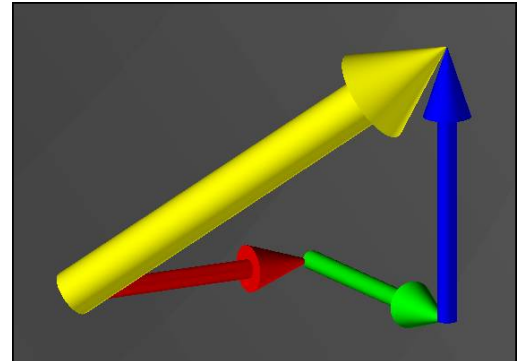
When outputting with vectors, the control requires at least one normalized vector that specifies the direction of the surface normals. The NC block optionally contains a second normalized vector that determines the direction of the tool orientation.

A normalized vector is a vector with the value 1. The vector value is calculated from the root sum of the squares of its components.

$$\sqrt{NX^2 + NY^2 + NZ^2} = 1$$



Vector output is the precondition for use of 3-D radius compensation depending on the tool's contact angle (Option 92).



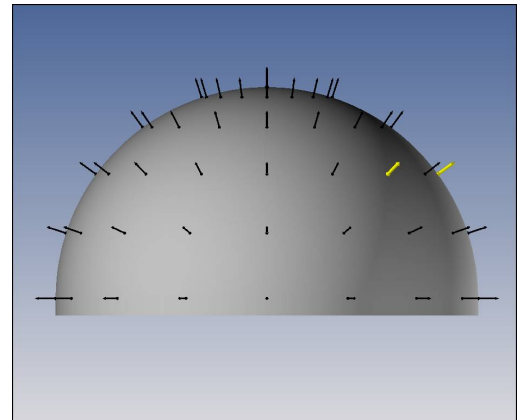
Example

LN X0.499 Y-3.112 Z-17.105 NX0.2196165 NY-0.1369522 NZ0.9659258 M128	Output without tool orientation
LN X0.499 Y-3.112 Z-17.105 NX0.2196165 NY-0.1369522 NZ0.9659258 TX+0.0078922 TY-0.8764339 TZ +0.2590319 M128	Output with tool orientation

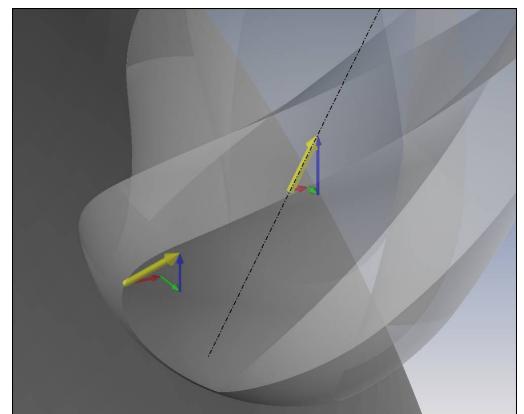
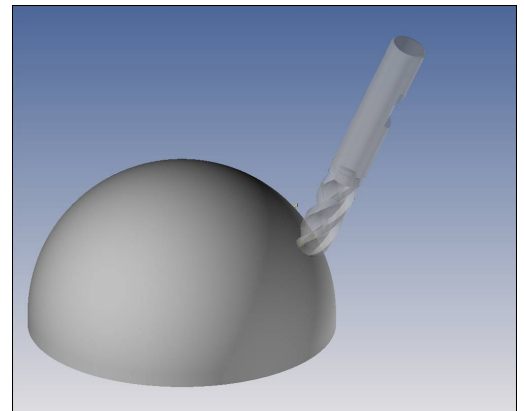
Structure of an NC block with vectors

```
LN X+0.499 Y-3.112 Z-17.105 NX0 NY0 NZ1 TX+0.0078922 TY-
0.8764339 TZ+0.2590319
```

NC word	Meaning
LN	Linear block with surface normal vector
X+0.499 Y-3.112 Z-17.105	Target coordinates
NX0 NY0 NZ1	Components of the surface normal vector
TX+0.0078922 TY-0.8764339 TZ+0.2590319	Components of the tool direction vector



Surface normal vector perpendicular to the contour



Tool direction vector

Comparison of output formats

	Klartext	Vectors
3-axis	X	X
5-axis	X	X
Axis angle	X	-
Spatial angle	X (TCPM)	X
Compensation / oversize	Hobbing RL, RR	Hobbing / face milling
Progpath is Contour	Hobbing RL, RR	Hobbing / face milling