Solid graphics

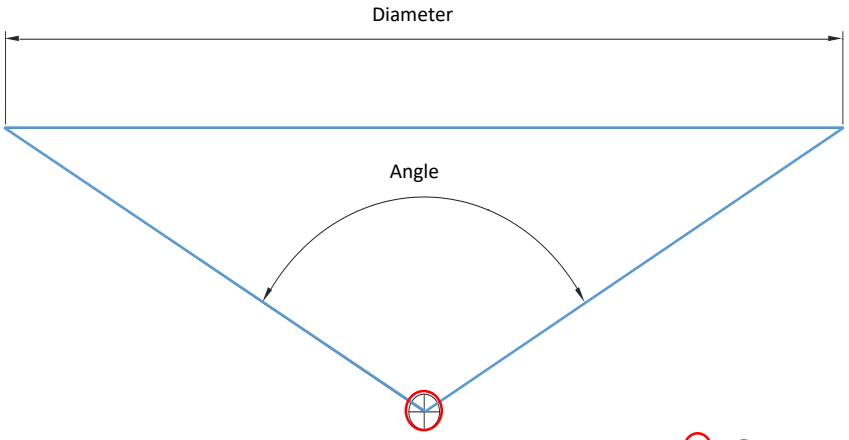
Solid graphics is based on polygonal mesh which is created by finding surface samples.

- Resolution can be changed between 1 and 128. Length of the Edge of the atomic cube is the largest dimension of the stock divided by the resolution value. Using low resolution speed will be increasing, but the model will be not so detailed. The model can be burst between close surfaces inside an atomic box. Edge of the atomic cube can be intersected by only one surface.
- Effect of Override Switch: Model is modified only at the end of the block by using maximal override. Using lower override value graphic engine polls intermediate points, animation will be smoother. Intermediate points can be filtered by setting trackbar *Minimal movement.*
- Effect of buffering: movements created by the block generator can be stored in an intermediate buffer. In test mode block generator decelerated if solid graphics has not enough time to process movements, block generator and solid graphics are synchronised. Otherwise block generation should not be decelerated, movements are stored in the intermediate buffer, some sort of latency can be experienced.
- Sharp features cannot be reproduced by the basic sampling algorithm. Sharp edges are repaired and signed by black lines by feature detection algorithm. If drawing latency is increased feature detection is switched of. *CosΘ* can be set by *Feature Detection Treshold Trackbar. CosΘ* is the dotproduct of the normalvector of adjacent faces. This parameter is the threshold for switching on/off sharp feature detection.
- Solid graphics needs extra information for cutting simulation. Please set the following data:
  - Tool graphic data is identified by D address. Changing tool by T command D address should be also programmed. D determines the row of graphic data in the tool offset table.
  - Switch on tool length compensation. Tool length compensation should greater then cut length and greater than zero. Cut length is used only for drawing the tool body.
  - Diameter should be changed for both milling and drilling.
  - Stock should be defined by G2902 or G2905.
- Following tool geometries has been defined for solid modelling:

Type		Parameters
Mill Tool		
End mill		diameter, Cut length, Full length
Ball nose		diameter, Cut length, Full length
Drill		diameter, drill angle(118deg), Full length, Cut length,
Tapper		diameter, angle, cutting length, Full length
Negative rad mill		diameter, angle, cutting length, Full length r
Turn Tool		
Turn		Q, thickness, K (Angle entering), B (Cut Width),
Thread		Q , thickness, A (form angle), C (reach),
Groove		Q , D (start width), (Cut Width), thickness, C (Cut lenght), A (Full length)

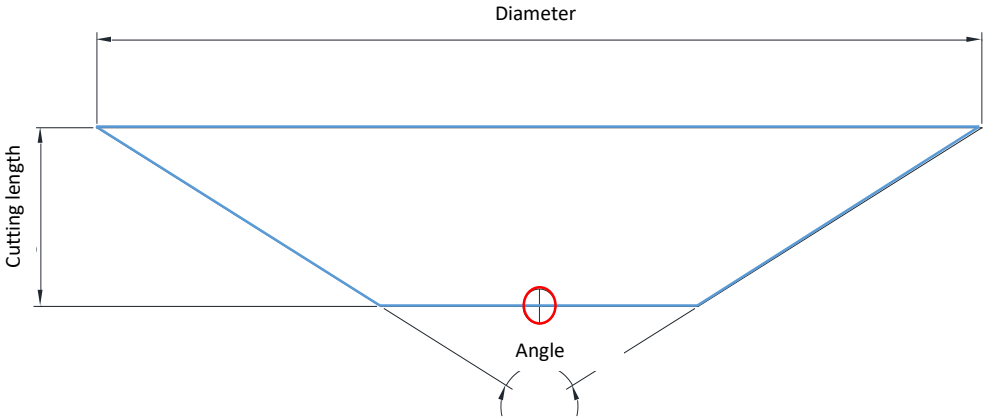
Programmed point is at the bottom-centre point of the tool.

Drilling tool data

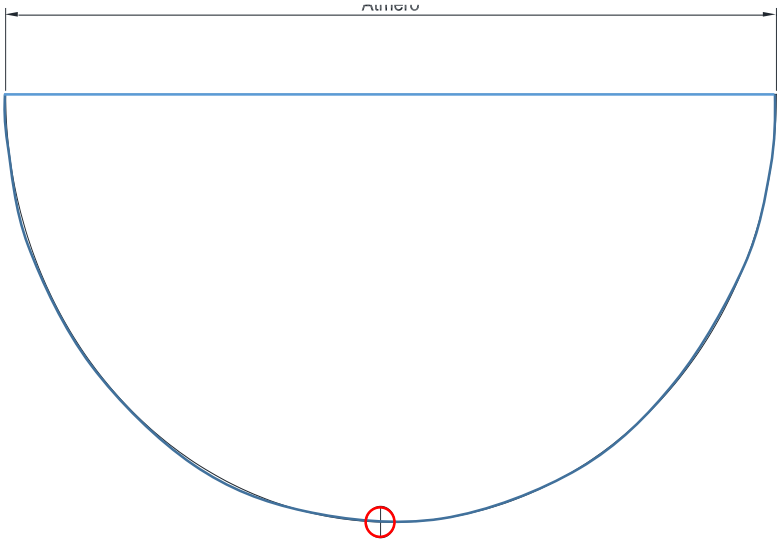


Programmed point of tool

Taper tool data



Ball nose tool data



Example for tool data for solid graphics

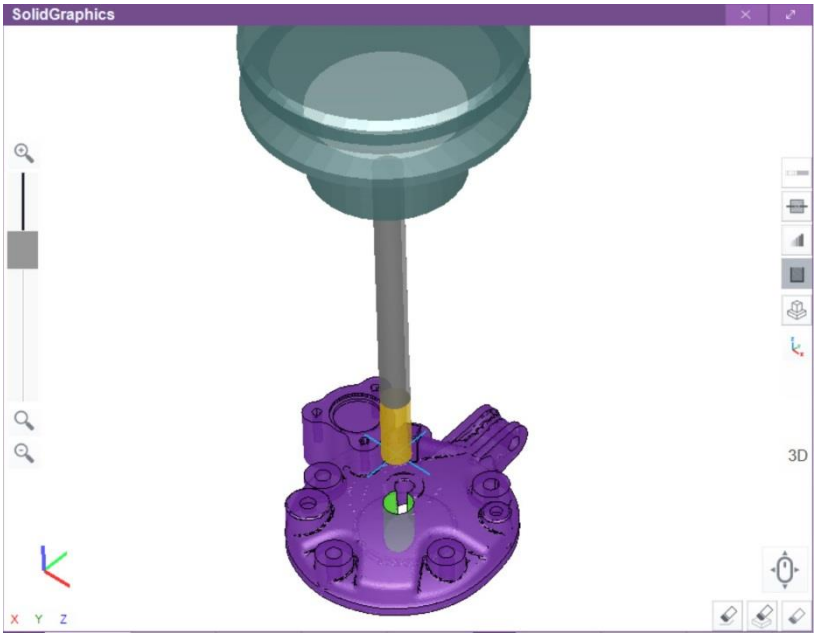
Tool offset (Mill) table

[mm]	L ge...	L wear	D g...	D wea	r ge...	r wear	Q v...	Type	Angle	Cut l...	Nr. ...	Sha...	Comment
N1	150....	0.000	10.000	0.000	0.000	0.000	0	End mill	---	40.000	2	10.000	10mm SZÁ...
N2	150....	0.000	3.000	0.000	0.000	0.000	0	End mill	---	40.000	2	6.000	3 mm SZÁR...
N3	150....	0.000	16.000	0.000	---	---	0	Drill	90.000	8.000	2	16.000	nc KÖZPON...
N4	150....	0.000	10.000	0.000	0.000	0.000	0	End mill	---	40.000	3	10.000	1.5 MENET...
N5	150....	0.000	63.000	0.000	0.000	0.000	0	Tapper	45.000	8.000	5	30.000	63 mm SÍK...
N6	150....	0.000	10.000	0.000	---	---	0	Drill tap	40.000	50.000	2	6.000	M10 MENE...
N7	150....	0.000	8.400	0.000	0.000	0.000	0	End mill	---	50.000	2	8.000	8.4 mm szár...
N8	150....	0.000	20.000	0.000	0.000	0.000	0	End mill	---	50.000	4	20.000	20 mm szár...

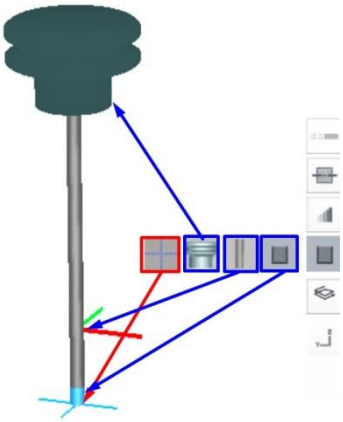
Jump (N):

This table can be found by pressing Offset (F7) / Tool offset table M. (F5) buttons.

Solid graphics Window:



This window can be activated by pressing View (F5) / Solid graphic (F3) buttons.



Display tool body is switched on/ off, cross ,shank, cut parts on/off

OFF / ON	On state (green), all tool changes to change color.
	Display tool path only
	Display workpiece only
	Display toolpath an workpiece
STL	Original STL view.
G	Draw to end point G code.
TP	Transparent function. **versions after 15.26**
	Zoompanel show or hide.

Select view 8 figure.

	Figure can be rotated by pointing device
	Figure can be moved by pointing device
	Only move.
	Only Rotate.

Clear buttons:

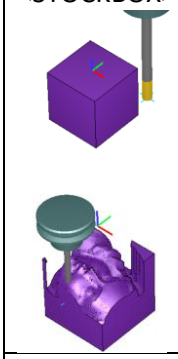
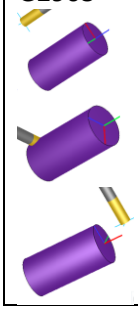
	All clear.
	Solid Clear
	Line clear.

Open settings window:

Resolution: number of atomic cubes (see above)
Feature detection treshold: *CosΘ* is the dotproduct of the normalvector of adjacent faces. This parameter is the threshold for switching on/off sharp feature detection
Minimal movement: Intermediate movements can be filtered out. Intermediate movements helps only smoother animation.
Patch Line Width: All line Px size.
def: Set all settings default.

If figure seems to be overpitched, press Isometric (F4) button on soft-key.

Stock definition

<table>
<tr>
<td>G2902
<STOCKBOX>
  </td>
<td>Cube (Cuboid) or STL model
<table>
<tr><td>X, Y, Z</td><td>Width, length, height if cube stock is defined</td></tr>
<tr><td>I, J, K</td><td>Vector from the stock zero to the programmed zero.
Stock zero is on the top-centre point of the stock. If X,Y,Z is not programmed these values are offsets for the STL model</td></tr>
<tr><td><.\<i>filename.stl</i>></td><td>Filename of STL model. If this parameter is defined X,Y,Z parameters are skipped. <.\ <i>filename.stl</i>> S1 save Solidmodel.</td></tr>
</table></td>
</tr>
<tr>
<td>G2905
  </td>
<td>Cylinder
<table>
<tr><td>D</td><td>Diameter of the cylinder</td></tr>
<tr><td>H</td><td>Height of the cylinder</td></tr>
<tr><td>I, J, K</td><td>Vector from the stock zero to the programmed zero.
Stock zero is on the top-centre point of the stock.</td></tr>
<tr><td>C 1</td><td>90 rotate stock, XY top of Z direction. Default!</td></tr>
<tr><td>B 1</td><td>90 rotate stock, ZX top of Y direction.</td></tr>
<tr><td>A 1</td><td>90 rotate stock, ZY top of X direction.</td></tr>
</table></td>
</tr>
</table>

STL model import (versions after 14.6)

In an STL file, the object must consist of a single workpiece, but it can be hollow. Hollow objects must consist of an outer shell and one or more inner shells. It must be possible to move between any two points within the object without crossing any of the triangles. The model must be a unified solid without internal boundaries.

Wall thicknesses must still exceed the size of the elemental cube. The object consists of 128x128x128 elemental cubes, which are rearranged in STL files to optimize the filling of the object. The size of the elemental cube, in the worst case, will be one 128th of the object's largest dimension. Solid modeling is like a monitor with pixels: lines smaller than the pixel size cannot be represented (unless zoomed in). Here, instead of pixels (elemental squares), we have voxels (elemental cubes), and instead of lines, we deal with surfaces.

Example: For a rectangular hollow section measuring 2500x100x50, the program arranges the elemental cubes in a 650x56x28 configuration, achieving four times finer resolution. The minimum wall thickness that can be represented will be 2500/650 = 3.84. Using the pixel analogy, long thin objects are best viewed on a long thin monitor.

Transparent function (versions after 15.26)