# Cutting data for milling
# RAKU® TOOL WB-1404

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### formula for calculating speed (spindle)

$$n = \frac{V_c \times 1000}{D_c \times \pi}$$

14986[rpm] = $\frac{940\ [m/min] \times 1000}{20,0\ [mm] \times 3,14}$

### formula for calculating axis feed rate

$$V_f = n \times f_z \times z_n$$

6900 [mm/min] = 15000 [rpm] x 0,230 [mm] x 2 [number]

### validated cutting data for roughing

| Type | $D_c$ [mm] | $z_n$ [number] | $V_c$ [m/min] | $f_z$ [mm] | n [rpm] | $V_f$ [mm/min] | $a_e$ [mm] | $a_p$ [mm] | $L_1$ [mm] | $L_2$ [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| torus | 20,0 | 2 | 940 | 0,230 | 14.968 | 6.885 | 10,00 | 20,00 | 86,0 | 20,0 |
| torus | 12,0 | 2 | 560 | 0,210 | 14.862 | 6.242 | 6,00 | 12,00 | 55,0 | 16,0 |
| torus | 6,0 | 2 | 280 | 0,205 | 14.862 | 6.093 | 3,00 | 6,00 | 23,0 | 8,0 |

### validated cutting data for finishing

| Type | $D_c$ [mm] | $z_n$ [number] | $V_c$ [m/min] | $f_z$ [mm] | n [rpm] | $V_f$ [mm/min] | $a_e$ [mm] | $a_p$ [mm] | $L_1$ [mm] | $L_2$ [mm] |
|---|---|---|---|---|---|---|---|---|---|---|
| ball | 20,0 | 2 | 940 | 0,600 | 14.968 | 17.962 | 0,20 | 2,00 | 67,0 | 17,0 |
| ball | 12,0 | 2 | 560 | 0,580 | 14.862 | 17.240 | 0,12 | 1,20 | 52,0 | 10,5 |
| ball | 6,0 | 2 | 280 | 0,570 | 14.862 | 16.943 | 0,06 | 0,60 | 23,0 | 10,0 |

### recommended cutting data for roughing

| parameter | symbol | unit | roughing recommendation min. | roughing recommendation ideal | roughing recommendation max. |
|---|---|---|---|---|---|
| radial infeed: | $a_e$ | [mm] | - x $D_c$ | **0,50 x $D_c$** | 0,50 x $D_c$ |
| axial infeed: | $a_p$ | [mm] | 0,10 x $D_c$ | **1,00 x $D_c$** | 1,00 x $D_c$ |
| number of teeth: | $z_n$ | [number] | 2 | **2** | 4 |

### recommended cutting data for finishing

| parameter | symbol | unit | finishing recommendation min. | finishing recommendation ideal | finishing recommendation max. |
|---|---|---|---|---|---|
| radial infeed: | $a_e$ | [mm] | - x $D_c$ | **0,01 x $D_c$** | 0,05 x $D_c$ |
| axial infeed: | $a_p$ | [mm] | 0,01 x $D_c$ | **0,10 x $D_c$** | 0,2 x $D_c$ |
| number of teeth: | $z_n$ | [number] | 2 | **2** | 4 |

| parameter | symbol | unit | user specifications |
|---|---|---|---|
| cutting speed: | $V_c$ | [m/min] | selection in the diagram |
| feed/tooth: | $f_z$ | [mm] | selection in the diagram |
| speed (spindle): | n | [rpm] | calculation by user |
| axis feed rate: | $V_f$ | [mm/min] | calculation by user |
| cutting diameter: | $D_c$ | [mm] | processing specific |
| tool total length: | $L_0$ | [mm] | processing specific |
| tool unclamping length: | $L_1$ | [mm] | processing specific |
| tool cutting length: | $L_2$ | [mm] | processing specific |

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# Cutting data diagram for milling
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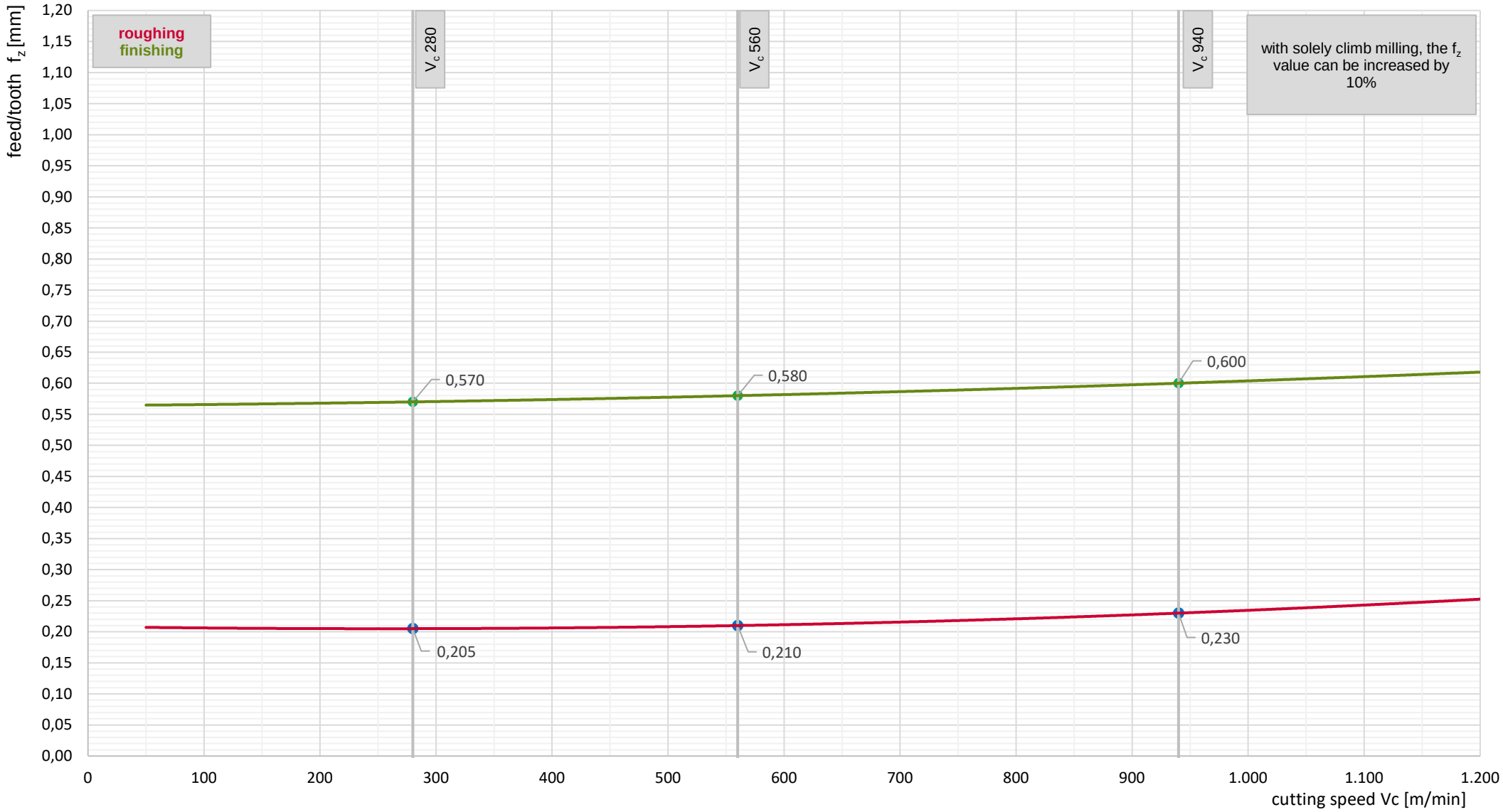



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# Practical application of the cutting data
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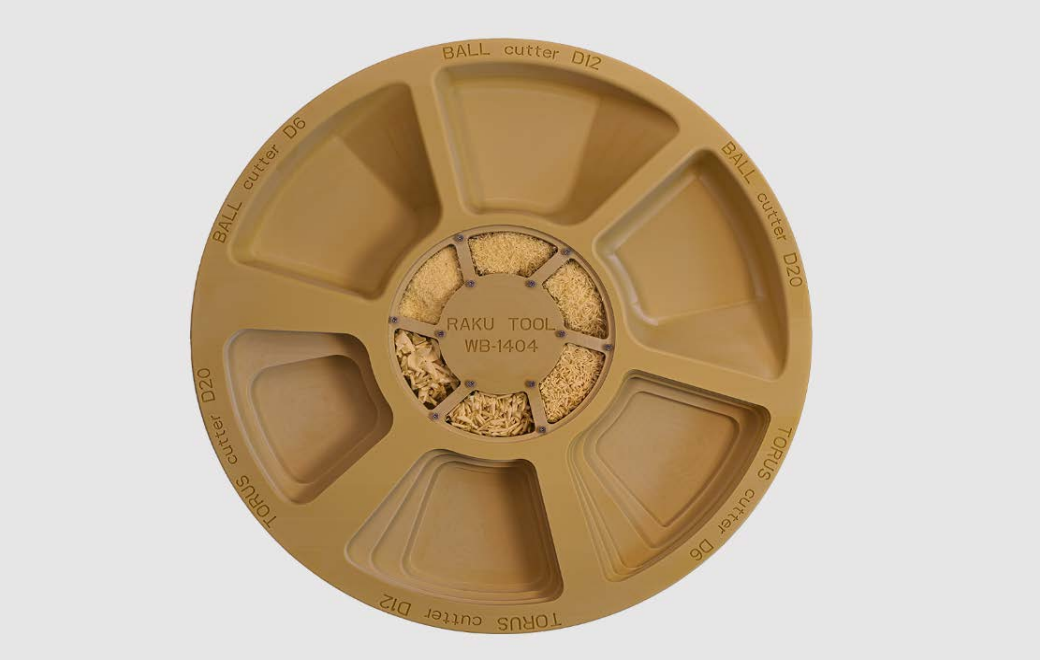
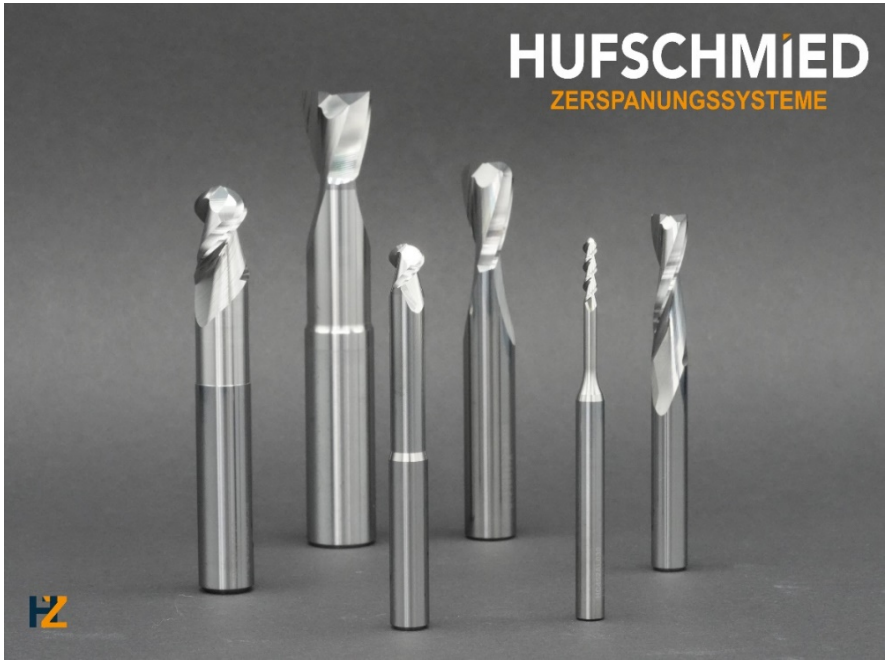
**cutting data used on the demonstrator**

| sequence of processing | processing strategy | $a_e$ | $a_p$ | offset | $f_z$ | $V_c$ |
|---|---|---|---|---|---|---|
| roughing torus D6 | vol. roughing following contour | 3,00 | 6,00 | 0,60 | 0,23 | 280 |
| roughing torus D12 | vol. roughing following contour | 6,00 | 12,00 | 0,12 | 0,21 | 560 |
| roughing torus D20 | vol. roughing following contour | 10,00 | 20,00 | 2,00 | 0,21 | 940 |
| finishing ball D6 | zigzag stroke milling | 0,06 | 0,60 | 0,00 | 0,57 | 280 |
| finishing ball D12 | zigzag stroke milling | 0,12 | 1,20 | 0,00 | 0,58 | 560 |
| finishing ball D20 | zigzag stroke milling | 0,20 | 2,00 | 0,00 | 0,60 | 940 |

**tools used on the demonstrator**

| tool manufacturer | tool type | $D_c$ | $L_0$ | $L_1$ | $L_2$ | $z_n$ |
|---|---|---|---|---|---|---|
| hufschmied-tools.com/de/ | PROTO-LINE / Torus | 6,0 | 60,0 | 23,0 | 8,0 | 2 |
| hufschmied-tools.com/de/ | PROTO-LINE / Torus | 12,0 | 100,0 | 55,0 | 16,0 | 2 |
| hufschmied-tools.com/de/ | PROTO-LINE / Torus | 20,0 | 104,0 | 86,0 | 20,0 | 2 |
| hufschmied-tools.com/de/ | PROTO-LINE / Kugel | 6,0 | 60,0 | 23,0 | 10,0 | 2 |
| hufschmied-tools.com/de/ | PROTO-LINE / Kugel | 12,0 | 83,0 | 52,0 | 10,5 | 2 |
| hufschmied-tools.com/de/ | PROTO-LINE / Kugel | 20,0 | 104,0 | 67,0 | 17,0 | 2 |

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