# Cutting data for milling
# RAKU® TOOL CC-6504

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### formula for calculating speed (spindle)

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

14968 [rpm] = $\frac{940\ [m/min] \times 1000}{20,0\ [mm] \times 3,14}$

### formula for calculating axis feed rate

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

9000 [mm/min] = 15000 [rpm] x 0,300 [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 | 0,300 | 14.968 | 8.981 | 10,00 | 20,00 | 87,0 | 20,0 |
| torus | 12,0 | 2 | 560 | 0,380 | 14.862 | 11.295 | 6,00 | 12,00 | 55,0 | 16,0 |
| torus | 6,0 | 2 | 280 | 0,370 | 14.862 | 10.998 | 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 | 0,700 | 14.968 | 20.955 | 0,20 | 2,00 | 67,0 | 17,0 |
| ball | 12,0 | 2 | 500 | 0,770 | 13.270 | 20.435 | 0,12 | 1,20 | 52,0 | 10,5 |
| ball | 6,0 | 2 | 247 | 0,800 | 13.110 | 20.977 | 0,06 | 0,60 | 23,0 | 10,0 |

### recommended cutting data for roughing

| parameter | symbol | unit | roughing recommendation min. | ideal | max. |
|---|---|---|---|---|---|
| radial infeed: | $a_e$ | [mm] | - x $D_c$ | **0,50 x $D_c$** | 0,80 x $D_c$ |
| axial infeed: | $a_p$ | [mm] | 0,10 x $D_c$ | **1,00 x $D_c$** | 2,00 x $D_c$ |
| number of teeth: | $z_n$ | [number] | 2 | **2** | 4 |

### recommended cutting data for finishing

| parameter | symbol | unit | finishing recommendation min. | ideal | max. |
|---|---|---|---|---|---|
| radial infeed: | $a_e$ | [mm] | - x $D_c$ | **0,01 x $D_c$** | 0,10 x $D_c$ |
| axial infeed: | $a_p$ | [mm] | 0,01 x $D_c$ | **0,10 x $D_c$** | 0,50 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 |

**RAMPF** Tooling Solutions GmbH & Co. KG

Robert-Bosch-Straße 8-10 I D-/2661 Grafenberg
T +49.71 23.93 42-1600 I F +49.71 23.93 42-1666
E tooling.solutions@rampf-group.com

# Cutting data diagram for milling
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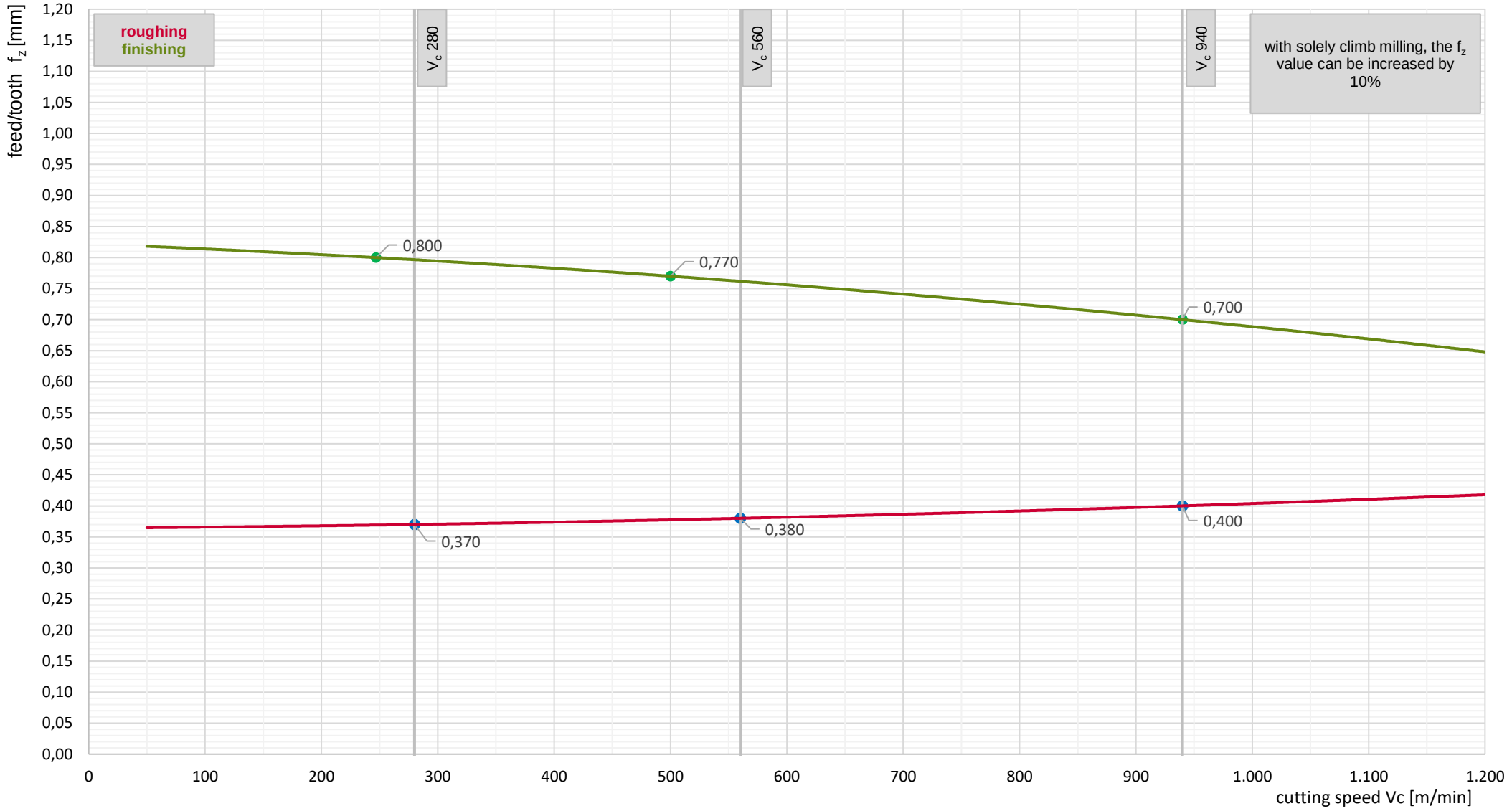



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# Practical application of the cutting data
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**cutting data used on the demonstrator**

| 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 | 0,00 | 0 |
| roughing torus D12 | vol. roughing following contour | 6,00 | 12,00 | 0,12 | 0,00 | 0 |
| roughing torus D20 | vol. roughing following contour | 10,00 | 20,00 | 2,00 | 0,00 | 0 |
| finishing ball D6 | zigzag stroke milling | 0,06 | 0,60 | 0,00 | 0,00 | 0 |
| finishing ball D12 | zigzag stroke milling | 0,12 | 1,20 | 0,00 | 0,00 | 0 |
| finishing ball D20 | zigzag stroke milling | 0,20 | 2,00 | 0,00 | 0,00 | 0 |

**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 | 68,0 | 17,0 | 2 |


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