Formulas and example calculations

Calculation of spindle revolutions [min-1]:[*1]

$$n = \frac{V_C \cdot 1000}{\pi \cdot d_{C/eff}}$$

Calculation of feed per tooth [mm/tooth]:

$$f_z = \frac{V_f}{(n \cdot z)}$$

Calculation of feed rate [mm/min]:

$$V_f = n \cdot z \cdot f_z$$

Calculation of required machine power [kW]:[*2]

$$P = \frac{a_e \cdot a_p \cdot V_f}{P}$$

Calculation of cutting speed [m/min]:[*1]

$$V_C = \frac{\pi \cdot d_{C/eff} \cdot n}{1000}$$

Calculation of feed per revolution [mm/U]:

$$f_n = z \cdot f_z \qquad f_n = \frac{V_f}{n}$$

Calculation of machining time [min]:

$$T = \frac{l_f}{V_f}$$

Calculation of chip volume [cm³/min]:

$$Q = \frac{a_e \cdot a_p \cdot V_f}{1000}$$

[*1] Please note that on flat contours, the effective tool diameter must be used for the calculation

[*2] Please note: This formula is used to calculate machine performance when machining steel.

Example calculation

Material		= 1.2343	Depth of cut	a_p	= 0.2 mm
Cutter		= NVV 1192 85 0602	Width of cut	a_e	= f_z
Cutter diameter	d_c	= 6 mm	Cutting speed	V_c	= 100 m/min
Effective number of teeth	z	= 2	Feed per tooth	f_z	= 0.1 mm

Calculation of effective cutting edge diameter:

$$d_{eff} = 2\sqrt{0.2 \cdot (6 - 0.2) = 2.15}$$

Calculation of speed:

$$n = \frac{100 \cdot 1000}{\pi \cdot 2.15} = 14805 \text{ U/min}$$

Calculation of feed rate:

$$V_f = 14805 \cdot 2 \cdot 0.1 = 2961 \text{ mm/min}$$

Definition of terms

a_e	Width of cut [mm]
a_p	Depth of cut [mm]
d_c	Cutter diameter [mm]
d_{eff}	Effective tool diameter [mm]
f_z	Feed per tooth [mm/Zahn]
l_f	Total milling length [mm]
f_n	Feed per revolution [mm/U]
n	Spindle revolutions [U/min]
p	(Required) machine power [kW]
Q	Chip volume [cm³/min]
T	Machining time [min]
V_C	Cutting speed [m/min]
V_f	Feed rate [mm/min]
z	Effective number of teeth