Formulas and definitions for milling - METRIC

Table feed, mm/min

$$v_f = f_z \times n \times z_c$$

Cutting speed, m/min

$$v_c = \frac{\pi \times D_{cap} \times n}{1000}$$

Spindle speed, r/min

$$n = \frac{v_c \times 1000}{\pi \times D_{cap}}$$

Feed per tooth, mm

$$f_z = \frac{v_f}{n \times z_c}$$

Feed per revolution, mm/rev

$$f_z = \frac{v_f}{n}$$

Metal removal rate, cm3/min

$$Q = \frac{a_p \times a_e \times v_f}{1000}$$

Net power, kW

$$P_c = \frac{a_e \times a_p \times v_f \times k_c}{60 \times 10^6}$$

Torque, Nm

$$M_c = \frac{P_c \times 30 \times 10^3}{\pi \times n}$$

Symbol	Designation/ definition	Unit
a_e	Working engagement	mm
a_p	Cutting depth	mm
D_{cap}	Cutting diameter at cutting depth a_p	mm
D_m	Machined diameter (component diameter)	mm
f_z	Feed per tooth	mm
f_n	Feed per revolution	mm/r
n	Spindle speed	rpm
v_c	Cutting speed	m/min
v_f	Table feed	mm/min
z_c	Number of effective teeth	pcs
h_{ex}	Maximum chip thickness	mm
h_m	Average chip thickness	mm
k_c	Specific cutting force	N/mm2
P_c	Net power	kW
M_c	Torque	Nm
Q	Metal removal rate	cm3/min
κ_r	Entering angle	degree