Milling

Cutting Speed

$$Vc = \frac{\pi \times Dc \times n}{1{,}000}$$

Vc : Cutting Speed [m/min]
Dc : Cutter Diameter [mm]
n : Spindle Revolution [min^{-1}]

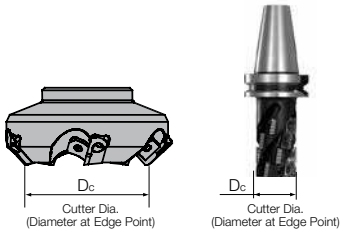
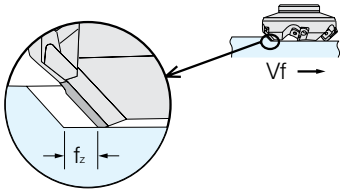


Table Feed & Feed per Tooth

$$Vc = \frac{Vf}{Z \times n}$$

fz : Feed per Tooth [mm/t]
Vf : Table Feed [mm/min]
Z : Number of Inserts
n : Spindle Revolution [min^{-1}]



Power Requirement

$$Pc = \frac{Ks \times Q}{6{,}120 \times \eta} = \frac{Ks \times ae \times Vf \times ap}{6{,}120{,}000 \times \eta}$$

$$= \frac{Ks \times ae \times fz \times Z \times N \times ap}{6{,}120{,}000 \times \eta}$$

Pc : Power Requirement [kW]
Vf : Power Requirement (Horse Power) [HP]
ae : Width of Cut [mm]
Vf : Table Feed [mm/min]
fz : Feed per Tooth [mm/t]
Z : Number of Inserts
n : Spindle Revolution [min^{-1}]
ap : Depth of Cut [mm]
Ks : Specific Cutting Force [kgf/mm^2]
η : Mechanical Efficiency (0.7~0.8)
Q : Chip Removal Volume [cm^3/min = cc/min]

Ks Figure	
Low Carbon Steel	190
Medium Carbon Steel	210
High Carbon Steel	240
Low Alloy Steel	190
High Alloy Steel	245
Cast Iron	93
Malleable Cast Iron	120
Bronze, Brass	70

Chip Removal Volume

$$Q = \frac{ae \times Vf \times ap}{1{,}000} = \frac{ae \times fz \times Z \times n \times ap}{1{,}000}$$

Q : Chip Removal Volume [cm^3/min = cc/min]
ae : Width of Cut [mm]
Vf : Table Feed [mm/min]
fz : Feed per Tooth [mm/t]
Z : Number of Inserts
n : Spindle Revolution [min^{-1}]
ap : Depth of Cut [mm]

Cutting Time

$$T = \frac{60 \times L'}{Vf} = \frac{60 \times L'}{fz \times Z \times n}$$

T : Cutting Time [seconds]
L' : Total Table Transfer Length [mm]
(= L + Ds + 2α)
L : Workpiece Length [mm]
Ds : Cutter Diameter [mm]
α : Idling Distance [mm]
Vf : Table Feed [mm/min]
fz : Feed per Tooth [mm/t]
Z : Number of Inserts
n : Spindle Revolution [min^{-1}]