Turning

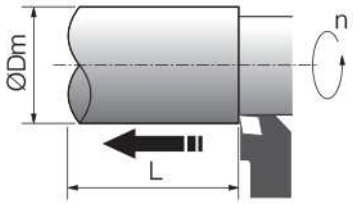
Cutting Speed

$$Vc = \frac{\pi \times Dm \times n}{1000}$$

Vc : Cutting Speed [m/min]

Dm : Workpiece Diameter [mm]

n : Spindle Revolution [min^{-1}]



Power Requirement

$$Pc = \frac{Ks \times Vc \times ap \times f}{6120 \times \eta}$$

$$P_{HP} = \frac{Ks \times Vc \times ap \times f}{4500 \times \eta}$$

Pc : Power Requirement [kW]

P_{HP} : Power Requirement (Horse Power) [HP]

Vc : Cutting Speed [m/min]

ap : Depth Of Cut [mm]

f : Feed Rate [mm/rev]

Ks : Specific Cutting Resistance [kgf/mm^2]

η : Mechanical Efficiency (0.7 ~ 0.8)

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

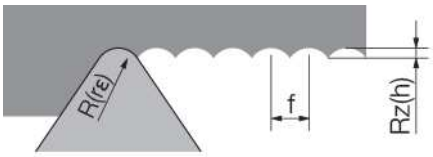
Surface Roughness

$$Rz=h = \frac{f2}{8 \times R(r\varepsilon)} \times 1000$$

Rz=h : Theoretical Surface Roughness [μm]

f : Feed Rate [mm/rev]

R(rε) : Corner Radius of Insert [mm]



Chip Removal Volume

$$Q = Vc \times ap \times f$$

Q : Chip Removal Volume [cm^3/min]

Vc : Cutting Speed [m/min]

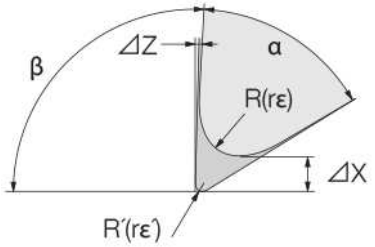
ap : Depth Of Cut [mm]

f : Feed Rate [mm/rev]

Edge Position Compensation

$$\Delta X = (R\text{-}R') \times \left\{ \frac{\cos(\frac{\alpha}{2} + (\beta - 90°))}{\sin\frac{\alpha}{2}} - 1 \right\}$$

$$\Delta Z = (R\text{-}R') \times \left\{ \frac{\sin(\frac{\alpha}{2} + (\beta - 90°))}{\sin\frac{\alpha}{2}} - 1 \right\}$$



ΔX : X-axis Direction Edge Position Compensation [mm]

ΔZ : Z-axis Direction Edge Position Compensation [mm]

R : Corner-R before Change [mm]

R' : Corner-R before Change [mm]

α : Insert Corner Angle [°]

β : Toolholder's Cutting Edge Angle [°]

Toolholder Type	Insert Corner Angle α	Cutting Edge Angle β	ΔX	ΔZ
PCLN	80°	95°	0.100 x (R-R')	0.100 x (R-R')
PTGN	60°	91°	0.714 x (R-R')	0.030 x (R-R')
PDJN	55°	93°	0.866 x (R-R')	0.099 x (R-R')
PDHN	55°	107.5°	0.531 x (R-R')	0.531 x (R-R')
PVLN	35°	95°	2.072 x (R-R')	0.273 x (R-R')
PVPN	35°	117.5°	1.351 x (R-R')	1.351 x (R-R')
PSBN	90°	75°	0.225 x (R-R')	-0.293 x (R-R')

Example: Compensation when changing corner-R from 0.80 to 0.40, using PCLN type holder,

ΔX= 0.100 x (0.80 - 0.40) = 0.04 (mm)

ΔZ= 0.100 x (0.80 - 0.40) = 0.04 (mm)