

Turning calculation worksheet

Keep requested cutting speed, allowed RPM and actual feed separate. Metric working copy.

01 RECORD THE INPUTS AND THEIR SOURCES

Job / exercise ID

Prepared by / date

Material + condition

Insert / holder / data source

Vc (m/min)

f (mm/rev)

RPM ceiling nmax

Feed travel L (mm)

The RPM ceiling must reflect the actual machine, workholding and workpiece limits. This worksheet does not choose it. Record its source before using the arithmetic.

02 CALCULATE AT THE ACTIVE CUTTING DIAMETER

Four linked calculations [1]

$$n_{CSS} = 1000 \times V_c / (\pi \times D)$$

$$n_{used} = \min(n_{CSS}, n_{max}) \quad | \quad V_c \text{ actual} = \pi \times D \times n_{used} / 1000$$

$$\text{Feed speed } v_f = f \times n_{used} \quad | \quad \text{time } t = L / v_f$$

D and total feed travel L in mm; n in rev/min; v_f in mm/min; t in minutes. Time assumes a constant-diameter, constant-RPM feed segment and excludes rapids, dwell, acceleration and tool changes. Model varying-diameter moves separately; one diameter cannot represent an entire facing move.

03 HYPOTHETICAL COMPARISON - NOT CUTTING-DATA ADVICE

Two separate 80 mm straight feed segments; V_c = 150 m/min, f = 0.16 mm/rev, assumed ceiling 1800 RPM. Values below retain unrounded RPM for arithmetic.

D	nCSS / nused	Vc actual	v _f	t
60 mm	795.775 / 795.775	150.000 m/min	127.324 mm/min	37.699 s
20 mm	2387.324 / 1800	113.097 m/min	288.000 mm/min	16.667 s
Your D:	____ / ____ RPM	____ m/min	____ mm/min	____ s

Clamp begins at $D = 1000V_c/(\pi n_{max}) = 26.526$ mm in this example. Below this diameter, the same RPM ceiling cannot maintain the requested V_c. A Haas G50 limit is one documented implementation [2]; other controls may differ.

Ideal finish is not inspection

Use a geometry comparison to ask better questions - then verify the actual surface.

04 SEPARATE THE TWO SURFACE QUANTITIES

Conventional circular-nose geometry only

Common planning approximation: $Ra \approx 1000 \times f^2 / (32r) \text{ } \mu\text{m}$

Exact circular cusp height: $h = 1000 \times [r - \sqrt{r^2 - f^2/4}] \text{ } \mu\text{m}$

Here f is mm/rev and nose radius r is mm. Require $0 < f < 2r$; the Ra approximation is most useful when f is small relative to r .

The cusp is peak-to-valley geometry, not a measured Rz . The common Ra expression is an approximation, not an exact integral of the circular profile. Wiper inserts, edge hones, wear, built-up edge, vibration and material behavior can invalidate this simple comparison [3].

Hypothetical case	f (mm/rev)	r (mm)	Ra estimate	Cusp h
Baseline	0.16	0.80	1.000 μm	4.010 μm
Half feed	0.08	0.80	0.250 μm	1.001 μm
Half nose radius	0.16	0.40	2.000 μm	8.082 μm

05 PLANNING AND MEASUREMENT RECORD

Selected f / r and geometry estimate

Drawing parameter + limit + unit

Instrument / filter / evaluation length

Measured value + direction / location

Tool condition / instability observed

Review notes / next controlled check

A smaller feed is not automatically a better process: rubbing and chip-control limits may intervene. Neither the calculation nor an isolated measurement approves the setup. Check the drawing's actual parameter and inspection method; Ra and Rz are not interchangeable.

[Online: Turning speeds & feeds calculator](#)

[Online: Turning surface finish calculator](#)

[1] Sandvik Coromant - General Turning Formulas and Definitions

[2] Haas Automation - G50 Spindle Speed Limit

[3] Mitsubishi Materials - Advanced Turning: Surface Roughness