

Taper geometry checking sheet

A dimensional calculation record for a straight, right-circular taper - not a fit standard.

01 DEFINE THE GEOMETRY

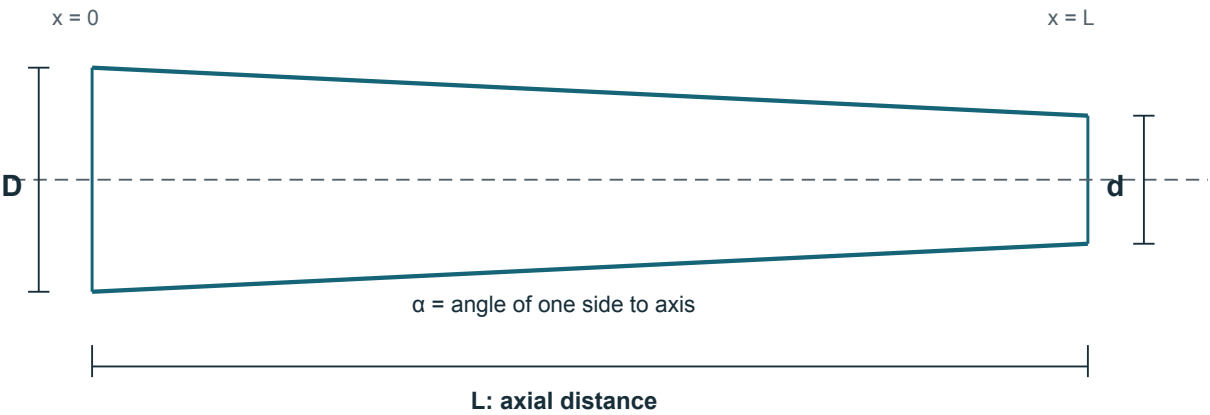
Drawing / revision / datum reference

Prepared by / date / length unit

Large diameter D

Small diameter d

Axial length L



Included angle = 2α ; it is not the compound-scale setting on every machine.

Keep diameter change and one-sided slope separate [1]

Diameter taper $T = (D - d)/L$ | one-sided slope = $T/2$

Half-angle $\alpha = \text{atan}(T/2)$ | included angle = 2α

Diameter ratio 1:n has $n = L/(D - d)$. Angles are shown in degrees. Use the same length unit for D, d and L; require $D > d > 0$ and $L > 0$.

02 CHECK THE INVERSE BEFORE RECORDING THE ANSWER

T / 1:n

Half-angle α

Included angle 2α

Rebuilt $D = d + 2L \tan(\alpha)$

Difference from original D

☐ L was measured along the axis, not along the sloping surface.

☐ No claim of Morse, toolholder or pipe-taper conformity from the angle alone.

Check at known axial stations

Use two station diameters to compare a slope, then examine what the comparison cannot prove.

03 HYPOTHETICAL GEOMETRY AND REVERSE CHECK

$D = 40$ mm, $d = 28$ mm, $L = 120$ mm. Then $T = 12/120 = 0.100$, or **1:10**; $\alpha = 2.862405^\circ$ and $2\alpha = 5.724810^\circ$. Rebuilding $28 + 2 \times 120 \times \tan(2.862405^\circ)$ returns approximately 40.000 mm (rounded angle).

Station prediction - x is measured from the large end

$D(x) = D - T \times x$, for $0 \leq x \leq L$.

At $x = 40$ mm: $D(40) = 36.000$ mm.

At $x = 90$ mm: $D(90) = 31.000$ mm.

Expected diameter difference is 5.000 mm across 50.000 mm of axial separation.

04 TWO-STATION RECORD

Station / item	Drawing / predicted	Your measurement
Station 1: x_1 , diameter D_1	$x_1 = \underline{\hspace{1cm}}$; $D_1 = \underline{\hspace{1cm}}$	$x_1 = \underline{\hspace{1cm}}$; $D_1 = \underline{\hspace{1cm}}$
Station 2: x_2 , diameter D_2	$x_2 = \underline{\hspace{1cm}}$; $D_2 = \underline{\hspace{1cm}}$	$x_2 = \underline{\hspace{1cm}}$; $D_2 = \underline{\hspace{1cm}}$
$\Delta x = x_2 - x_1$; $\Delta D = D_1 - D_2$	$\Delta x = \underline{\hspace{1cm}}$; $\Delta D = \underline{\hspace{1cm}}$	$\Delta x = \underline{\hspace{1cm}}$; $\Delta D = \underline{\hspace{1cm}}$
$T_{\text{check}} = \Delta D / \Delta x$; $\alpha_{\text{check}} = \text{atan}(T_{\text{check}}/2)$	$T = \underline{\hspace{1cm}}$; $\alpha = \underline{\hspace{1cm}}$	$T = \underline{\hspace{1cm}}$; $\alpha = \underline{\hspace{1cm}}$

Illustrative readings only: $D_1 = 36.02$ mm and $D_2 = 31.04$ mm at the two stated stations give $T_{\text{check}} = 4.98/50 = 0.0996$ and $\alpha_{\text{check}} = 2.850975^\circ$. These invented readings demonstrate arithmetic; they are not inspection evidence or a pass/fail result.

Instrument / resolution / temperature

Drawing limits + uncertainty / review

Two diameters alone do not establish roundness, straightness, surface finish, gauge-line position or mating contact. Station-location errors also affect the slope. Use the drawing's inspection plan and the actual machine's angle reference before interpreting results [2].

[Online: Taper calculator](#)

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

[1] Grizzly - T10502/T10556/T26300 manual, printed p.10: amount of taper

[2] Sherline - Compound Slide: product instructions and angle-scale context