

Shafts, Keys & Retention

Mechanical Engineering

How torque gets into a shaft, and what actually limits the diameter.

Choose the torque path first, then check what limits the section.

Getting torque in and out

Parallel key in a keyway, the default

Splines for high torque or sliding

Interference fit, no stress raiser

Taper lock bush, easy to remove

Shear pin: cheap, deliberate fuse

What limits the shaft

Torsional shear at the smallest diameter

Bending fatigue at every shoulder

Deflection at the gear or pulley

Critical speed near running speed

A keyway cuts strength by about a quarter

Generous fillet radii at shoulders buy more fatigue life than a stronger steel does, and cost nothing.