

CNC Design-for-Manufacturability (DFM) Checklist

10 Rules to Reduce Machining Costs & Lead Times

1. Pre-Design Sanity Check

- **Function:** Does this part bear heavy loads, or is it strictly cosmetic?
- **Material:** Can standard Aluminum 6061 work, or do you truly need Stainless Steel/Titanium?
- **Volume:** Is this a one-off prototype, or a 1,000-unit production run?

2. Tolerances

- Use Standard Tolerances:** Default to ± 0.1 mm (or ± 0.125 mm) for all non-critical dimensions to allow maximum feed rates.
- Isolate Tight Tolerances:** Restrict tight tolerances (e.g., ± 0.025 mm) exclusively to critical mating surfaces, bearing press fits, or O-ring grooves.
- Add a Title Block Note:** Always include: *"Unless otherwise specified, all dimensions are ± 0.1 mm"* to prevent machinists from over-engineering the part.

3. Feature Geometry

- Maximize Internal Radii:** Size internal corner radii to be slightly larger than **1/3 of the pocket depth** to allow for robust end mills.
- Limit Pocket Depths:** Keep the depth-to-width ratio strictly under **4:1** to prevent tool deflection and chatter.
- Check Wall Thickness:** Ensure metal walls are at least **0.8 mm** thick (and plastics at least **1.5 mm**) to prevent vibration and warping during machining.

4. Holes & Threads

- Standardize Drill Sizes:** Size all holes to match standard fractional, wire, letter, or metric drill bits.
- Cap Thread Depth:** Do not tap deeper than **2x to 3x** the hole diameter. Deeper threads add zero functional strength and risk tap breakage.

5. Setups & Finishing

- Design for One Plane:** Place as many features as possible on a single face to avoid costly manual setups and part re-orientations.
- Simplify Finishes:** Default to an "as-machined" finish (**Ra 3.2 μm**) and eliminate machined text/logos to save cycle time. Use laser engraving later if needed.

Prototyping to Production - Manufacturing Made Simple

Need help optimizing your next design?
Upload your CAD file at www.clarwe.com for an online quote and expert DFM feedback.