

Bay Engineering – Surface Finish Chart (Ra)

This chart provides typical surface roughness values (Ra) for common machining and finishing processes. Values are indicative—material, tooling condition, geometry, machine setup, and finishing direction can significantly affect the achieved result. If a surface is functional (sealing, bearing, sliding, optical, etc.), please highlight it at enquiry stage.

How to specify surface finish

- Ra (arithmetical mean roughness) is the most common surface finish specification for machined parts.
- Indicate the Ra value and the surfaces it applies to (e.g., “Ra 1.6 µm on sealing face”).
- If the direction of lay matters (e.g., for sealing), note it on the drawing.
- If the surface will be coated (anodise/plating/paint), state whether the Ra requirement is pre- or post-finish.

Surface finish chart – typical Ra by process

Ra (µm)	Ra (µin)	Typical process(es)	Notes
12.5	~500	Rough milling/turning; sawn surfaces	Often acceptable for non-functional faces; visible tool marks.
6.3	~250	General CNC milling/turning (standard)	Common default for many machined parts where not specified.
3.2	~125	Finishing pass (milling/turning)	Improved appearance; suitable for many mating surfaces.
1.6	~63	Fine turning; fine milling; boring	Often used for sealing/mating faces where moderate smoothness is needed.

0.8	~32	Reaming / precision boring; fine turning; light grinding	May require controlled tooling and inspection; geometry and material dependent.
0.4	~16	Grinding (surface/cylindrical)	Typically for bearing fits and tight tolerance surfaces.
0.2	~8	Honing / superfinishing; fine grinding	Used for sliding/rotating interfaces; often paired with tight form control.
0.1	~4	Lapping / polishing	Special process; usually for critical sealing, optics, or very low friction.

Visual Finishes

Processes such as bead blasting, brushing, and cosmetic polishing are often specified for appearance and handling rather than a controlled Ra. If you need both appearance and a measured Ra on the same face, please call this out clearly.

- **Bead blast:** Produces an even, matte appearance; can reduce visible tool marks but may not lower Ra in a controlled way.
- **Brushing/linishing:** Creates a directional grain; useful for cosmetic faces—specify direction if important.
- **Polishing:** Improves shine and may reduce Ra depending on method; edges and fine features can be affected.

What to include with your RFQ

- Drawing/model with surfaces clearly marked with Ra requirements
- Which surfaces are functional (sealing, bearing, sliding, cosmetic, etc.)
- Material and any heat treatment requirements
- Any coating/finish requirements and whether Ra applies pre- or post-finish
- Any inspection/reporting requirements for surface roughness

Important note: The Ra values above are typical and not guaranteed unless specified on the drawing and agreed at quotation stage. Where very low Ra is required, additional processes (e.g., grinding, honing, lapping) and suitable datum/inspection plans may be necessary.