

# Accuracy of Surface Finish of Single Point Diamond Turned Materials



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DM007

The surface accuracy of single point diamond turned surfaces is generally very good when compared to standard metal machining methods. However, where surface roughness does vary significantly, this is generally a function of the aspect ratio, geometry of a component and the material that is being machined.

Diamond turned surfaces are typically measured for surface roughness (Ra) in nanometres (nm), Form error or PV in (microns) (1 fringe equating to 0.3165 microns) and also step height for diffractive surfaces - again measured in microns.

Table 1 shows the typical surface finish values for different materials that should be readily achievable using good quality diamond turning or diamond fly-cutting lathes for component manufacture. The maximum component diameter is also shown.

Material	Finish (RMS)	Figure (PV)	Maximum Diameter
Germanium	3nm	0.3 $\mu$ m	Up to 700mm
Zinc Selenide	5nm	0.5 $\mu$ m	Up to 700mm
Zinc Sulphide	3nm	0.3 $\mu$ m	Up to 700mm
Silicon	5-10nm	0.75 $\mu$ m	Up to 700mm
Amtir	5-10nm	0.75 $\mu$ m	Up to 700mm
Chalcogenides	5-10nm	0.6 $\mu$ m	Up to 700mm
Acrylic-PMMA	5-10nm	0.75 $\mu$ m	Up to 700mm
Aluminium Alloys T6061	<12nm	0.75 $\mu$ m	Up to 700mm
Nickel Plating	<10nm	0.6 $\mu$ m	Up to 700mm
Copper	<12nm	0.75 $\mu$ m	Up to 700mm

Table 1. Typical surface finish values for IR materials and aerospace aluminium alloys

Surface figure and form error can also have a direct correlation with surface finish. Generally speaking, the rougher the surface finish the greater the figure and form error value can be, therefore the smoother the surface, the better the surface figure and form tends to be.

Surface figure and form error can be measured using a variety of contact and non-contact techniques, including surface profiling, the Low Voltage Displacement Transducer probe, interferometric use of computer generated holograms, interferometric use of null lens and interferometric measurement of diffractive steps. These methods are discussed in more detail in Technical Data Sheet DM006, "Measuring Diamond Turned Aspheric and Diffractive Surfaces".

Application Note



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