



Difference between Ra and RMS

Ra and RMS both represent surface roughness, but are calculated differently. Ra is the Roughness Average of the measured microscopic peaks and valleys of a surface. RMS is the Root Mean Square of the measured microscopic peaks and valleys of a surface. Each value uses the same individual height measurements of surface peaks and valleys, but in different formula. The formulas are shown above. It can be seen that a single large peak or flaw within the microscopic surface texture will affect (raise) the RMS value more than the Ra value.

Equivalent Ra values for surface finish grade numbers

Roughness values Ra micrometres	Roughness values Ra micro inches	Roughness Grade Numbers
50	2000	N12
25	1000	N11
12.5	500	N10
8.3	250	N9
3.2	125	N8
1.6	63	N7
0.8	32	N6
0.4	16	N5
0.2	8	N4
0.1	4	N3
0.05	2	N2
0.025	1	N1

