

Technical Data

Stone Code Explanation Chart & Surface Finish Guide

K-8	—	A	5	7	Abrasive Types A-Aluminum Oxide C,J-Silicon Carbide DM, DR, DV-Diamond NM, NR, NV-CBN/Borazon	Grit Size 1- 70 8- 400 2- 80 9- 500 3- 100 0- 600 4- 150 80- 800 5- 220 90- 900 6- 280 10- 1000 7- 320 00- 1200			Hardness 1- Soft 3- 5- 7- 9- 11- 13- 15- Hard		
Series		Abrasive Type	Grit Size	Hardness							

Note: For special abrasive needs, contact your Sunnen Field Engineer.

Approximate Surface Finish in Micrometers (μm) R_a

Material	Abrasive Type	Grit Size									
		80	100	150	220	280	320	400	500	600	1200
Hard Steel	Aluminum Oxide/ Silicon Carbide	0,65	-	0,50	0,45	0,30	0,25	0,12	0,08	0,03	
	CBN/Borazon	-	1,40*2,00	1,15	1,00	0,70	-	0,50	-	0,18	0,05
Soft Steel	Aluminum Oxide/ Silicon Carbide	2,00	-	0,90*1,40	0,65	0,50*0,90	0,40	0,18*0,25	0,10*0,20	0,05	
	CBN/Borazon	-	1,60*2,50	-	1,25*2,00	-	-	0,65	-	0,40	0,12
Cast Iron	Silicon Carbide	2,50	-	0,75*1,00	0,50	0,30	0,25	0,15	0,12	0,08	
	Diamond	-	-	-	2,00	-	-	1,27	-	0,50	0,30
Aluminum, Brass, Bronze	Silicon Carbide	4,30	-	2,00	1,40	0,85	0,70	0,40	0,30	0,05	
Carbide	Diamond	-	-	0,75	0,50	-	-	0,18	-	0,08	0,03
Ceramic	Diamond	-	-	1,27	1,00	-	-	0,50	-	0,40	0,25
Glass	Diamond	-	-	2,40	1,80	-	-	0,75	-	0,40	0,20

Formulas for determining minimum stock removal required on diameter to achieve desired surface finish.

Surface Finish in Micrometers—(μm) R_a

$$\frac{\text{Existing Finish} - \text{Desired Finish}}{100} = \text{Required Stock Removal}$$

Example: Existing Finish = 1.25 μm ; Desired Finish = 0.25 μm

$$\frac{1.25 - 0.25}{100} = 0.01 \text{ mm}$$

Surface Finish Conversions: Millimeter to Inch—To convert one unit of measure to the other use the following formulas.

Micrometer to microinch: Micrometer x 40 = Microinch

Approximate Surface Finish in Microinches (μin) R_a

Material	Abrasive Type	Grit Size									
		80	100	150	220	280	320	400	500	600	1200
Hard Steel	Aluminum Oxide/ Silicon Carbide	25	-	20	18	12	10	5	3	1	
	CBN/Borazon	-	55*80	45	40	28	-	20	-	7	2
Soft Steel	Aluminum Oxide/ Silicon Carbide	80	-	35*55	25	20*35	16	7*10	4*8	2	
	CBN/Borazon	-	65*100	-	50*80	-	-	25	-	16	5
Cast Iron	Silicon Carbide	100	-	30*40	20	12	10	6	5	3	
	Diamond	-	-	-	80	-	-	50	-	20	12
Aluminum, Brass, Bronze	Silicon Carbide	170	-	80	55	33	27	16	12	2	
Carbide	Diamond	-	-	30	20	-	-	7	-	3	1
Ceramic	Diamond	-	-	50	40	-	-	20	-	15	10
Glass	Diamond	-	-	95	70	-	-	30	-	15	8

Formulas for determining minimum stock removal required on diameter to achieve desired surface finish.

Surface Finish in Microinches—(μin) R_a

$$\frac{\text{Existing Finish} - \text{Desired Finish}}{100,000} = \text{Required Stock Removal}$$

Example: Existing Finish = 50 μin ; Desired Finish = 10 μin

$$\frac{50 - 10}{100,000} = 0.0004 \text{ inch}$$

Surface Finish Conversions: Inch to Millimeter—To convert one unit of measure to the other use the following formulas.

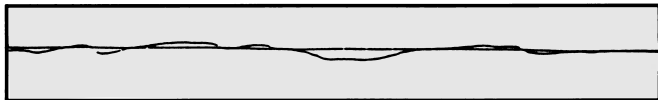
Microinch to micrometer: Microinch \div 40 = Micrometer

*If two values are shown: the first number is for small parts, honed on machines with one horsepower or less; the second number is for large parts, honed on machines with two or more horsepower.

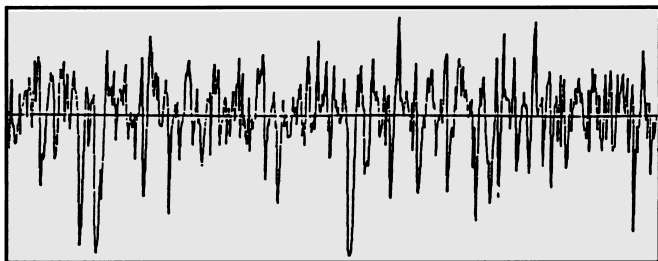
Technical Data

Surface Finish Information

This is what a rough honed surface looks like, magnified 400 times:



But it usually is shown like this:

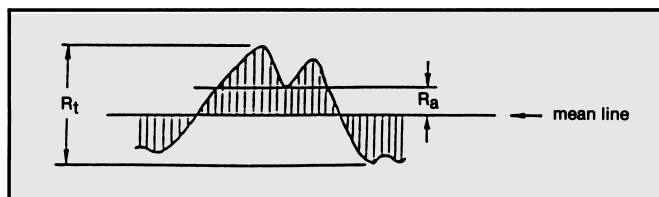


The vertical magnification is now 4000 times, so it can be seen better. The horizontal magnification is now only 40 times, to save paper. Both graphs show the same surface finish.

Surface Finish Parameters

Modern surface texture analyzers have the capability of measuring a variety of surface texture parameters. Every parameter has its advantages and limitations. A summary of some of the more commonly used parameters is given below.

Ra is the most widely used description of a surface. If you could level all the peaks to fill in all the valleys you would have a mean line. The arithmetic average of the deviations up and down from this theoretical mean line is Ra.



Rt is the distance from the highest peak to the deepest valley. Rt is rarely specified, but it is useful for detecting honing problems, like pick-up or areas which have not cleaned up. If Rt is much more than 10 times Ra you either have a honing problem or a plateau-honed surface.

CLA (center line average) is used in Britain and is identical to Ra.

Rz DIN, also known as **Rtm** is the same as Rt, but while Rt is established over the entire measuring length, Rz DIN divides the measured length into five equal lengths and then averages the Rt readings of each of the five lengths. Rz DIN is likely to be a slightly smaller number than Rt because one deeper scratch is diminished by the finer finish of the other four values.

Rz ISO (ten point high). The average height difference between the five highest peaks and five deepest valleys. This is the best method for short surfaces.

Rmax (same as Ry or Rma) is the distance of the highest peak to the deepest valley in any of the five sections mentioned in Rz DIN.

Rp (maximum peak height above mean line). The height of the highest peak above the mean line in five sampling distances.

Rpm (mean peak height above mean line). The average of the distances above the mean line of the five highest peaks in the total sampling distance.

RMS, Rq (root mean square). An obsolete definition; same method as Ra, but using a different mathematical principle. Results in a value about 15% higher than Ra.

Rk The main bearing area of a surface, ignoring the highest peaks and deepest valleys. The magnitude of these peaks and valleys can be defined as Rpk and Rvk respectively.

Parameter Conversion Formula*

To convert a known Ra value to a different parameter, use the following formula:

$Ra \times \text{Parameter Factor} = \text{Desired Parameter}$

Ex: 1.0 micrometer Ra \times 8.7 (Rt Factor) = 8.7 micrometer Rt

Ex: 40 microinch Ra \times 8.7 (Rt Factor) = 348 microinch Rt

*These conversions are approximate values for general information only and apply only when checking a standard honed finish.

Parameter	Factor
Rt	8.7
Rz	7.2
Rz ISO	7.6
Rmax	8.0
Rp	3.6
RPM	2.9
RMS	1.1