

VDI 3400 Surface Finish Grade Definition

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Measurement of surface finish is done with instruments called profile-meter. Experience proves that measurement of surface finish by comparison using a surface finish gauge does not give an error above 2 CH classes. The criteria of roughness are the Ra (Europe) – CLA (UK) – AA (USA) To obtain a grading of roughness, Charmilles has defined a CH scale, which is however cross referenced with the standards that are in common use.

VDI 3400	Ra = CLA = AA		class
AGIE CHARMILLES	µm	µ inch	ISO 1302
0	0,10	4,0	N3
1	0,11	4,4	
2	0,12	4,8	
3	0,14	5,0	
4	0,16	6,4	
5	0,18	7,2	
6	0,20	8,0	N4
7	0,22	8,8	
8	0,25	10,0	
9	0,28	11,2	
10	0,32	12,8	
11	0,35	14,0	
12	0,40	16,0	N5
13	0,45	18,0	
14	0,50	20,0	
15	0,56	22,4	
16	0,63	25,2	
17	0,70	28,0	
18	0,80	32,0	
19	0,90	36,0	N6
20	1,00	40,0	
21	1,12	44,8	
22	1,26	50,4	
23	1,40	56	
24	1,62	63	
25	1,80	72	N7
26	2,00	80	
27	2,20	88	
28	2,50	100	
29	2,80	112	
30	3,20	125	N8
31	3,50	140	
32	4,00	160	
33	4,50	180	
34	5,00	200	
35	5,60	224	
36	6,30	250	N9
37	7,00	280	
38	8,00	320	
39	9,00	360	
40	10,00	400	
41	11,20	448	
42	12,60	500	N10
43	14,00	560	
44	16,00	640	
45	18,00	760	

Grade Definition of Roughness

$$\text{No. CH} = 20 * \text{Log}(10 \text{ Ra})(\mu\text{m})$$

Some significant rules and figures

1 µm Ra = CH20
 10 µm Ra = CH40
 If $\text{Ra} = x \cdot 2 \rightarrow \text{CH} = \text{CH} + 6$
 ex: 1 µm Ra = CH20
 2 µm Ra = CH26
 4 µm Ra = CH32

The ratio
 between 2 successive CH units is 1.12

The difference
 between 2 successive CH units is 12.2%

The MAX Rt: roughly equal to 8 x Ra

The mean Rt: is the arithmetic mean of the 5 Max Rt recorded on the 5 sample lengths selected.
 (For establishing the technology: 0.8mm)

$$\text{Mean Rt} = 5 \times \text{the Ra value}$$

Note:
 In surface finish measurements a tolerance of + 2 CH units is accepted.

Further note:
 The American and English standards admit the following relationship between the values V(RMS) and V(Ra):

$$\text{V(RMS)} = 1.11 \text{ V(Ra)}$$

The French standard **NF 05051** is tied in with the **ISO 1302** standard concerning classes of surface finish.