

Surface Roughness (JIS B 0601-2001)

Theoretical (Geometrical) Surface Roughness

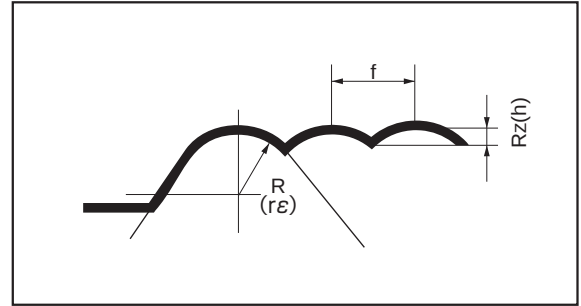
Theoretical Surface Roughness at Turning indicates the minimum roughness value from the cutting conditions and it is shown by the formula as follows:

$$R_z(h) = \frac{f^2}{8R(r\epsilon)} \times 10^3$$

$R_z(h)$: Theoretical Surface Roughness (μm)

f : Feed Rate (mm/rev)

$R(r\epsilon)$: Corner Radius of Insert (mm)



How to Obtain Surface Roughness Values

Type	Symbol	How to Obtain	Explanation
Max. Height Roughness	R_z	R_y is obtained from the distance in micron meter between the highest peak and the lowest valley in the range of sampled reference length (l) to the direction of mean line of the roughness curve. $R_z = R_p + R_v$	
Ten Points Mean Roughness	R_{zJIS}	R_z is obtained from the total in micron meter of the mean value of the each distance between the mean line and 5 peaks (Y_p) from the highest one, and the mean value of the each distance between the mean line and the 5 valleys (Y_v) from the lowest one, of the roughness curve in the range of sampled reference length " l ". $R_{zJIS} = \frac{(Y_{p1} + Y_{p2} + Y_{p3} + Y_{p4} + Y_{p5}) + (Y_{v1} + Y_{v2} + Y_{v3} + Y_{v4} + Y_{v5})}{5}$	 $Y_{p1}, Y_{p2}, Y_{p3}, Y_{p4}, Y_{p5}$: Distance from the mean line to highest 5 peaks in the range of sampled reference length " l " $Y_{v1}, Y_{v2}, Y_{v3}, Y_{v4}, Y_{v5}$: Distance from the mean line to the lowest 5 valleys in the range of sampled reference length " l "
Arithmetical Mean Roughness	R_a	R_a is obtained from the following formula in micron meter when the roughness curve is expressed by $y=f(x)$, taking X-axis to the mean line direction and Y-axis to the vertical magnification of the roughness curve in the range of sampled reference length " l ". $R_a = \frac{1}{l} \int_0^l f(x) dx$	

Relationship with Triangle Symbol

Arithmetical Mean Roughness $R_a(\mu m)$	Max. Height Roughness $R_z(\mu m)$	Ten Points Mean Roughness $R_{zJIS}(\mu m)$	Note: (Relationship with Triangle)
0.025	0.1	0.1	
0.05	0.2	0.2	
0.1	0.4	0.4	
0.2	0.8	0.8	
0.4	1.6	1.6	
0.8	3.2	3.2	
1.6	6.3	6.3	
3.2	12.5	12.5	
6.3	25	25	
12.5	50	50	
25	100	100	

Note: Finishing symbol (Triangle▽ and wave~) was abolished from JIS standard from 1994 Revision.

• How to Indicate

Example

① When R_a is 1.6μm → 1.6μm R_a

② When R_z is 6.3μm → 6.3μm R_z

③ When R_{zJIS} is 6.3μm → 6.3μm R_{zJIS}

Indication in JIS Standard

Example of R_a Indication	Example of $R_y, (R_z)$ Indication
① When indicating the upper limit only (when upper limit is 6.3μm R_a) 	① When indicating upper limit only Indicate surface roughness following the parameter symbol.
② When indicating both lower and upper limit (when upper limit is 6.3μm R_a , lower limit is 1.6μm R_a) 	② When indicating both lower and upper limit Indicate surface roughness as (upper limit ~ lower limit) following the parameter symbol.

Note: The indications of R_a and R_z are different.

Surface Roughness Symbol Caution

The above information is based on JIS B 0601-2001.

However, some symbols were revised as shown in the right table in accordance with ISO Standard from JIS B 0601-2001 version.

Ten Points Mean Roughness (R_z) was eliminated from 2001 version but it still remains as R_{zJIS} reference, since it was popular in Japan.

Type	Symbol of JIS B 0601-1994	Symbol of JIS B 0601-2001
Max. Height Roughness	R_y	R_z
Ten Points Mean Roughness	R_z	(R_{zJIS})
Arithmetical Mean Roughness	R_a	R_a

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Technical Information