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Grain Formulas

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List of 13 Grain Formulas

Grain

1) Grain-aspect Ratio

$$\text{fx } r_g = \frac{W_{g\text{Max}}}{t_{g\text{Max}}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 0.26 = \frac{78\text{mm}}{300\text{mm}}$$

2) Grain-aspect Ratio given Constant for Grinding Wheel

$$\text{fx } r_g = \frac{6}{C_g \cdot K \cdot \sqrt{D_t}}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 0.26 = \frac{6}{5 \cdot 13.32346 \cdot \sqrt{120\text{mm}}}$$

3) Infeed given Constant for Grinding Wheel

$$\text{fx } f_{\text{in}} = \left(t_{g\text{Max}}^2 \cdot \frac{V_t}{K \cdot V_w} \right)^2$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 3.277079\text{mm} = \left((300\text{mm})^2 \cdot \frac{50\text{m/s}}{13.32346 \cdot 5.9\text{m/s}} \right)^2$$



4) Infeed given Metal Removal Rate during Grinding

$$fx \quad F_{in} = \frac{Z_w}{A_p \cdot V_w}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 1.329693mm = \frac{0.00375m^3/s}{478mm \cdot 5.9m/s}$$

5) Material Removal Rate in Cylindrical and Internal Grinder

$$fx \quad Z_{gMax} = \pi \cdot f_t \cdot d_w \cdot T$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 14.82518m^3/s = \pi \cdot 3m/rev \cdot 121mm \cdot 13m/s$$

6) Material Removal Rate in Horizontal and Vertical Spindle Surface-Grinder

$$fx \quad Z_g = f_c \cdot a_p \cdot T$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 3.705m^3/s = 0.5m/rev \cdot 570mm \cdot 13m/s$$

7) Material Removal Rate in Plunge-Grinder

$$fx \quad Z_{gMax} = \pi \cdot a_p \cdot d_m \cdot v_f$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 14.82518m^3/s = \pi \cdot 570mm \cdot 350mm \cdot 23.65414m/s$$

8) Metal removal rate during Grinding

$$fx \quad Z_w = f_i \cdot a_p \cdot V_w$$

[Open Calculator !\[\]\(aff7c69c44a5e015f18c35867ef3f5c3_img.jpg\)](#)

$$ex \quad 0.00375m^3/s = 1.115mm \cdot 570mm \cdot 5.9m/s$$



9) Number of Active Grains per Unit Area given Constant for Grinding Wheel

$$fx \quad C_g = \frac{6}{K \cdot r_g \cdot \sqrt{D_t}}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 5.000003 = \frac{6}{13.32346 \cdot 0.26 \cdot \sqrt{120\text{mm}}}$$

10) Number of Active Grains per Unit Area on Wheel Surface

$$fx \quad C_g = \frac{N_c}{V_t \cdot a_p}$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 5 = \frac{142.5}{50\text{m/s} \cdot 570\text{mm}}$$

11) Traverse Speed for Cylindrical and Internal Grinder given MRR

$$fx \quad U_{\text{trav}} = \frac{Z_w}{\pi \cdot f \cdot D_m}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 0.004834\text{m/s} = \frac{0.00375\text{m}^3/\text{s}}{\pi \cdot 0.70\text{m/rev} \cdot 352.74\text{mm}}$$



12) Traverse Speed in Horizontal and Vertical Spindle Surface-Grinder given MRR

$$\text{fx } V_{\text{trav}} = \frac{Z_w}{f \cdot d_{\text{cut}}}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$\text{ex } 0.369549\text{m/s} = \frac{0.00375\text{m}^3/\text{s}}{0.70\text{m/rev} \cdot 14.49643\text{mm}}$$

13) Width of Grinding Path given Metal Removal Rate

$$\text{fx } a_p = \frac{Z_w}{f_i \cdot V_w}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$\text{ex } 570.0388\text{mm} = \frac{0.00375\text{m}^3/\text{s}}{1.115\text{mm} \cdot 5.9\text{m/s}}$$



Variables Used





- a_p Back Engagement (Millimeter)
- A_p Width of Cut (Millimeter)
- C_g Number of Active Grains Per Area on Wheel Surface
- d_{cut} Depth of Cut (Millimeter)
- d_m Machined Surface Diameter (Millimeter)
- D_m Diameter of Machined Surface (Millimeter)
- D_t Diameter of Grinding Wheel (Millimeter)
- d_w Diameter of Work Surface (Millimeter)
- f Feed Rate (Meter Per Revolution)
- f_c Cross Feed Per Cutting Stroke (Meter Per Revolution)
- f_i Infeed in Grinding Operation (Millimeter)
- f_{in} Feed (Millimeter)
- F_{in} Infeed Given on Workpiece (Millimeter)
- f_t Feed Per Stroke of Machine Table (Meter Per Revolution)
- K Constant for Particular Grinding Wheel
- N_c Number of Chip Produced Per Unit Time
- r_g Grain Aspect Ratio
- T Traverse (Meter per Second)
- t_{gMax} Maximum Undeformed Chip Thickness (Millimeter)
- U_{trav} Traverse Speed in Cylindrical Grinding (Meter per Second)
- v_f Feed Speed in Plunge Grinding (Meter per Second)



- V_t Surface Speed of Wheel (Meter per Second)
- V_{trav} Traverse Speed of Work Table (Meter per Second)
- V_w Surface Speed of Workpiece (Meter per Second)
- w_{gMax} Maximum Width of Chip (Millimeter)
- Z_g Material Removal Rate (Cubic Meter per Second)
- Z_{gMax} Maximum Material Removal Rate (Cubic Meter per Second)
- Z_w Metal Removal Rate (Cubic Meter per Second)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **sqrt**, sqrt(Number)
A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement:** **Volumetric Flow Rate** in Cubic Meter per Second (m³/s)
Volumetric Flow Rate Unit Conversion 
- **Measurement:** **Feed** in Meter Per Revolution (m/rev)
Feed Unit Conversion 



Check other formula lists

- **Grain Formulas** 

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