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Wheel Centre Rates for Independent Suspension Formulas

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List of 12 Wheel Centre Rates for Independent Suspension Formulas

Wheel Centre Rates for Independent Suspension

1) Area of Brake Lining

$$\text{fx } A_l = \frac{w \cdot r_{BD} \cdot \alpha \cdot \pi}{180}$$

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

$$\text{ex } 0.002778\text{m}^2 = \frac{0.19\text{m} \cdot 0.4\text{m} \cdot 120^\circ \cdot \pi}{180}$$

2) Assumed Initial Roll Rate given Required Anti-Roll Bar Rate

$$\text{fx } K_\Phi = \left(K_{\Phi A} + K_W \cdot \frac{a^2}{2} \right) \cdot \frac{K_t \cdot \frac{a^2}{2}}{K_t \cdot \frac{a^2}{2} + K_{\Phi A} + K_W \cdot \frac{a^2}{2}}$$

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

$$\text{ex } 76693.26\text{Nm/rad} = \left(89351\text{Nm/rad} + 35239\text{N/m} \cdot \frac{(1.2\text{m})^2}{2} \right) \cdot \frac{321330\text{N/m} \cdot \frac{(1.2\text{m})^2}{2}}{321330\text{N/m} \cdot \frac{(1.2\text{m})^2}{2} + 89351\text{Nm/rad} + 35239\text{N/m} \cdot \frac{(1.2\text{m})^2}{2}}$$

3) Brake Fluid Pressure

$$\text{fx } P = \frac{F_{\text{cyl}}}{A}$$

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

$$\text{ex } 16666.67\text{N/m}^2 = \frac{500\text{N}}{0.03\text{m}^2}$$

4) Braking Efficiency

$$\text{fx } \eta = \left(\frac{F}{W} \right) \cdot 100$$

[Open Calculator !\[\]\(83bbbd261710c59db0214aa27b2edc0d_img.jpg\)](#)

$$\text{ex } 60 = \left(\frac{7800\text{N}}{13000\text{N}} \right) \cdot 100$$

5) Power Absorbed by Disc Brake

$$\text{fx } \text{power} = 2 \cdot p \cdot a_p \cdot \mu_p \cdot R_m \cdot n \cdot 2 \cdot n \cdot \frac{N}{60}$$

[Open Calculator !\[\]\(f507db636256ac11a5525ef93ec6b8d7_img.jpg\)](#)


$$\text{ex } 0.006105\text{W} = 2 \cdot 8\text{N/m}^2 \cdot 0.01\text{m}^2 \cdot 0.34 \cdot 0.25\text{m} \cdot 2.01 \cdot 2 \cdot 2.01 \cdot \frac{200/\text{min}}{60}$$



6) Required Anti-Roll Bar Rate [Open Calculator](#) 


$$\text{fx } K_{\Phi A} = K_{\Phi} \cdot \frac{K_t \cdot \frac{a^2}{2}}{K_t \cdot \frac{a^2}{2} - K_{\Phi}} - K_W \cdot \frac{a^2}{2}$$

$$\text{ex } 89350.41\text{Nm/rad} = 76693\text{Nm/rad} \cdot \frac{321330\text{N/m} \cdot \frac{(1.2\text{m})^2}{2}}{321330\text{N/m} \cdot \frac{(1.2\text{m})^2}{2} - 76693\text{Nm/rad}} - 35239\text{N/m} \cdot \frac{(1.2\text{m})^2}{2}$$

7) Ride Rate given Wheel Centre Rate [Open Calculator](#) 


$$\text{fx } K_r = \frac{K_t \cdot K_W}{K_t + K_W}$$

$$\text{ex } 31756.4\text{N/m} = \frac{321330\text{N/m} \cdot 35239\text{N/m}}{321330\text{N/m} + 35239\text{N/m}}$$

8) Tyre Rate given Required Anti-Roll Bar Rate [Open Calculator](#) 

$$\text{fx } K_t = \left(\frac{(K_{\Phi A} + K_W \cdot \frac{a^2}{2}) \cdot K_{\Phi}}{(K_{\Phi A} + K_W \cdot \frac{a^2}{2}) - K_{\Phi}} \right) \cdot \frac{2}{a^2}$$

$$\text{ex } 321326.7\text{N/m} = \left(\frac{(89351\text{Nm/rad} + 35239\text{N/m} \cdot \frac{(1.2\text{m})^2}{2}) \cdot 76693\text{Nm/rad}}{(89351\text{Nm/rad} + 35239\text{N/m} \cdot \frac{(1.2\text{m})^2}{2}) - 76693\text{Nm/rad}} \right) \cdot \frac{2}{(1.2\text{m})^2}$$

9) Tyre Vertical Rate given Wheel Centre Rate [Open Calculator](#) 

$$\text{fx } K_t = \frac{K_W \cdot K_r}{K_W - K_r}$$

$$\text{ex } 321330\text{N/m} = \frac{35239\text{N/m} \cdot 31756.4\text{N/m}}{35239\text{N/m} - 31756.4\text{N/m}}$$

10) Wheel Centre Rate [Open Calculator](#) 

$$\text{fx } K_W = \frac{K_r \cdot K_t}{K_t - K_r}$$


$$\text{ex } 35239\text{N/m} = \frac{31756.4\text{N/m} \cdot 321330\text{N/m}}{321330\text{N/m} - 31756.4\text{N/m}}$$



11) Wheel Centre Rate given Required Anti-Roll Bar Rate Open Calculator 

$$\text{fx } K_W = \frac{K_{\Phi} \cdot \frac{K_t \cdot \frac{a^2}{2}}{K_t \cdot \frac{a^2}{2} - K_{\Phi}} - K_{\Phi A}}{\frac{a^2}{2}}$$

$$\text{ex } 35238.18 \text{ N/m} = \frac{76693 \text{ Nm/rad} \cdot \frac{321330 \text{ N/m} \cdot \frac{(1.2 \text{ m})^2}{2}}{321330 \text{ N/m} \cdot \frac{(1.2 \text{ m})^2}{2} - 76693 \text{ Nm/rad}} - 89351 \text{ Nm/rad}}{\frac{(1.2 \text{ m})^2}{2}}$$

12) Work Done in Braking Open Calculator 

$$\text{fx } W_b = F \cdot S$$

$$\text{ex } 156000 \text{ N} \cdot \text{m} = 7800 \text{ N} \cdot 20 \text{ m}$$













Variables Used

- **a** Track Width of Vehicle (Meter)
- **A** Area of Master Cylinder Piston (Square Meter)
- **A_l** Area of Brake Lining (Square Meter)
- **a_p** Area of One Piston per Caliper (Square Meter)
- **F** Braking Force on Brake Drum (Newton)
- **F_{cyl}** Force Produced by Master Cylinder (Newton)
- **K_r** Ride Rate (Newton per Meter)
- **K_t** Tyre Vertical Rate (Newton per Meter)
- **K_w** Wheel Centre Rate (Newton per Meter)
- **K_φ** Assumed Initial Roll Rate (Newton Meter per Radian)
- **K_{φA}** Required Anti Roll Bar Rate (Newton Meter per Radian)
- **n** Number of Caliper Units
- **N** Revolution of Discs per Minute (1 Per Minute)
- **p** Line Pressure (Newton per Square Meter)
- **P** Brake Fluid Pressure (Newton per Square Meter)
- **power** Power Absorbed by Disc Brake (Watt)
- **r_{BD}** Brake Drum Radius (Meter)
- **R_m** Mean Radius of Caliper unit to Disc Axis (Meter)
- **S** Stopping Distance during Braking in Meters (Meter)
- **w** Brake Lining Width (Meter)
- **W** Weight of Vehicle (Newton)
- **W_b** Work done in Braking (Newton Meter)
- **α** Angle between Linings of Brake Shoes (Degree)
- **η** Braking Efficiency
- **μ_p** Coefficient of Friction of Pad Material



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Area** in Square Meter (m²)
Area Unit Conversion 
- **Measurement:** **Pressure** in Newton per Square Meter (N/m²)
Pressure Unit Conversion 
- **Measurement:** **Power** in Watt (W)
Power Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Angle** in Degree (°)
Angle Unit Conversion 
- **Measurement:** **Surface Tension** in Newton per Meter (N/m)
Surface Tension Unit Conversion 
- **Measurement:** **Torque** in Newton Meter (N*m)
Torque Unit Conversion 
- **Measurement:** **Torsion Constant** in Newton Meter per Radian (Nm/rad)
Torsion Constant Unit Conversion 
- **Measurement:** **Time Inverse** in 1 Per Minute (1/min)
Time Inverse Unit Conversion 



Check other formula lists

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