



# Rates for Axle Suspension in Race Car Formulas

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# List of 10 Rates for Axle Suspension in Race Car Formulas

# Rates for Axle Suspension in Race Car

### 1) Rear Track Width given Roll Rate

 $\mathbf{f}_{\mathrm{R}} = \sqrt{rac{\mathrm{K}_{\Phi} \cdot \mathrm{K}_{\mathrm{W}} \cdot \mathrm{T}_{\mathrm{s}}^{2}}{\left(\mathrm{K}_{\mathrm{W}} \cdot rac{\mathrm{T}_{\mathrm{s}}^{2}}{2} - \mathrm{K}_{\Phi}
ight) \cdot \mathrm{K}_{\mathrm{t}}}}$ 

Open Calculator

### 2) Rear Track Width given Roll Rate of Suspension with Anti-Roll Bar

 $t_R = \sqrt{2 \cdot rac{K_\Phi \cdot \left(R_{arb} + K_W \cdot rac{(T_s)^2}{2}
ight)}{\left(R_{arb} + K_W \cdot rac{T_s^2}{2} - K_\Phi
ight) \cdot K_t}}$ 

Open Calculator 🗗

ex

$$0.397566 m = \sqrt{2 \cdot \frac{11805 Nm/rad \cdot \left(4881.6 Nm/rad + 42419.8 N/m \cdot \frac{(0.9 m)^2}{2}\right)}{\left(4881.6 Nm/rad + 42419.8 N/m \cdot \frac{(0.9 m)^2}{2} - 11805 Nm/rad\right) \cdot 321300 N/m}}$$

## 3) Roll Rate

 $K_{\Phi} = rac{K_{
m t} \cdot rac{{
m t}_{
m R}^2}{2} \cdot K_{
m W} \cdot rac{{
m T}_{
m s}^2}{2}}{K_{
m t} \cdot rac{{
m t}_{
m R}^2}{2} + K_{
m W} \cdot rac{{
m T}_{
m s}^2}{2}}$ 

Open Calculator 🛂

$$\boxed{ \mathbf{ex} \ 16400.52 \mathrm{Nm/rad} = \frac{321300 \mathrm{N/m} \cdot \frac{(1.5\mathrm{m})^2}{2} \cdot 42419.8 \mathrm{N/m} \cdot \frac{(0.9\mathrm{m})^2}{2} }{321300 \mathrm{N/m} \cdot \frac{(1.5\mathrm{m})^2}{2} + 42419.8 \mathrm{N/m} \cdot \frac{(0.9\mathrm{m})^2}{2} } }$$





#### 4) Roll Rate with Anti-Roll Bar 🚰

 $K_{\Phi} = rac{K_t \cdot rac{t_R^2}{2} \cdot \left(R_{arb} + K_W \cdot rac{T_s^2}{2}
ight)}{K_t \cdot rac{t_R^2}{2} + R_{arb} + K_W \cdot rac{T_s^2}{2}}$ 

Open Calculator

## 5) Spring Track Width given Roll Rate

 $T_{s} = \sqrt{rac{K_{\Phi} \cdot K_{t} \cdot t_{R}^{2}}{\left(K_{t} \cdot rac{t_{R}^{2}}{2} - K_{\Phi}
ight) \cdot K_{W}}}$ 

Open Calculator

# 6) Spring Track Width given Roll Rate of Suspension with Anti-Roll Bar

 $T_{
m s} = \sqrt{2 \cdot \left(rac{rac{K_{\Phi} \cdot K_{
m t} \cdot rac{t_{
m R}^2}{2}}{\left(K_{
m t} \cdot rac{t_{
m R}^2}{2} - K_{
m \Phi}
ight)} - R_{
m arb}}}{K_{
m W}}
ight)}$ 

Open Calculator

 $= \sqrt{2 \cdot \left( \frac{\frac{11805 \text{Nm/rad} \cdot 321300 \text{N/m} \cdot \frac{(1.5 \text{m})^2}{2}}{\left(321300 \text{N/m} \cdot \frac{(1.5 \text{m})^2}{2} - 11805 \text{Nm/rad}\right)} - 4881.6 \text{Nm/rad}}{42419.8 \text{N/m}} \right) }$ 



### 7) Tyre Rate given Roll Rate

 $K_{
m t} = rac{K_{\Phi} \cdot \left(K_{
m W} \cdot rac{T_{
m s}^2}{2}
ight)}{\left(K_{
m W} \cdot rac{T_{
m s}^2}{2} - K_{\Phi}
ight) \cdot rac{t_{
m R}^2}{2}}$ 

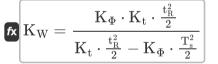
Open Calculator 🗗

## 8) Tyre Rate given Roll Rate of Suspension with Anti-Roll Bar

 $K_{
m t} = rac{K_{\Phi} \cdot \left(R_{
m arb} + K_{
m W} \cdot rac{T_{
m s}^2}{2}
ight)}{\left(R_{
m arb} + K_{
m W} \cdot rac{T_{
m s}^2}{2} - K_{\Phi}
ight) \cdot rac{t_{
m R}^2}{2}}$ 

Open Calculator

## 9) Vertical Tyre Axle Rate given Roll Rate



Open Calculator

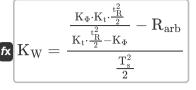
$$\boxed{ 11963.24 \text{N/m} = \frac{11805 \text{Nm/rad} \cdot 321300 \text{N/m} \cdot \frac{(1.5\text{m})^2}{2}}{321300 \text{N/m} \cdot \frac{(1.5\text{m})^2}{2} - 11805 \text{Nm/rad} \cdot \frac{(0.9\text{m})^2}{2}} } }$$



#### 10) Vertical Tyre Axle Rate given Roll Rate of Suspension with Anti-Roll Bar 🗗



Open Calculator



$$= \frac{18078.9 \text{N/m}}{18078.9 \text{N/m}} = \frac{\frac{11805 \text{Nm/rad} \cdot 321300 \text{N/m} \cdot \frac{(1.5 \text{m})^2}{2}}{321300 \text{N/m} \cdot \frac{(1.5 \text{m})^2}{2} - 11805 \text{Nm/rad}} - 4881.6 \text{Nm/rad}}{\frac{(0.9 \text{m})^2}{2}}$$





#### Variables Used

- K<sub>t</sub> Tyre Vertical Rate (Newton per Meter)
- Kw Wheel Centre Rate (Newton per Meter)
- K<sub>♠</sub> Roll Rate (Newton Meter per Radian)
- Rarb Roll Rate of Anti-Roll Bar (Newton Meter per Radian)
- t<sub>R</sub> Rear Track Width (Meter)
- T<sub>S</sub> Spring Track Width (Meter)





#### Constants, Functions, Measurements used

- Function: sqrt, sqrt(Number)
  Square root function
- Measurement: Length in Meter (m)
  Length Unit Conversion
- Measurement: Surface Tension in Newton per Meter (N/m) Surface Tension Unit Conversion
- Measurement: Torsion Constant in Newton Meter per Radian (Nm/rad)

  Torsion Constant Unit Conversion





#### Check other formula lists

- Rates for Axle Suspension in Race Car Formulas
- Ride Rate and Ride Frequency for Race Cars Wheel Centre Rates for Independent Formulas
- Vehicle Cornering in Race Cars Formulas
- Weight Transfer during Braking Formulas
  - Suspension Formulas

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