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List of 13 Pin Formulas

Pin

1) Diameter of Knuckle Pin given Bending Moment in Pin

$$\text{fx } d = \left(\frac{32 \cdot M_b}{\pi \cdot \sigma_b} \right)^{\frac{1}{3}}$$

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

$$\text{ex } 38.23545\text{mm} = \left(\frac{32 \cdot 450000\text{N} \cdot \text{mm}}{\pi \cdot 82\text{N}/\text{mm}^2} \right)^{\frac{1}{3}}$$

2) Diameter of Knuckle Pin given Bending Stress in Pin

$$\text{fx } d = \left(\frac{32 \cdot \frac{L}{2} \cdot \left(\frac{b}{4} + \frac{a}{3} \right)}{\pi \cdot \sigma_b} \right)^{\frac{1}{3}}$$

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

$$\text{ex } 38.70179\text{mm} = \left(\frac{32 \cdot \frac{50000\text{N}}{2} \cdot \left(\frac{40\text{mm}}{4} + \frac{26\text{mm}}{3} \right)}{\pi \cdot 82\text{N}/\text{mm}^2} \right)^{\frac{1}{3}}$$



3) Diameter of Pin of Knuckle Joint given Compressive Stress in Eye End Portion of Pin

$$\text{fx } d = \frac{L}{\sigma_c \cdot b}$$

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

$$\text{ex } 41.66667\text{mm} = \frac{50000\text{N}}{30\text{N/mm}^2 \cdot 40\text{mm}}$$

4) Diameter of Pin of Knuckle Joint given Compressive Stress in Fork End Portion of Pin

$$\text{fx } d = \frac{L}{2 \cdot \sigma_c \cdot a}$$

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

$$\text{ex } 32.05128\text{mm} = \frac{50000\text{N}}{2 \cdot 30\text{N/mm}^2 \cdot 26\text{mm}}$$

5) Diameter of Pin of Knuckle Joint given Diameter of Pinhead

$$\text{fx } d = \frac{d_1}{1.5}$$

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

$$\text{ex } 40\text{mm} = \frac{60\text{mm}}{1.5}$$



6) Diameter of Pin of Knuckle Joint given Load and Shear Stress in Pin

$$\text{fx } d = \sqrt{\frac{2 \cdot L}{\pi \cdot \tau_{\text{pin}}}}$$

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

$$\text{ex } 37.04086\text{mm} = \sqrt{\frac{2 \cdot 50000\text{N}}{\pi \cdot 23.2\text{N/mm}^2}}$$

7) Diameter of Pin of Knuckle Joint given Outer Diameter of Eye

$$\text{fx } d = \frac{d_o}{2}$$

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

$$\text{ex } 40\text{mm} = \frac{80\text{mm}}{2}$$

8) Diameter of Pin of Knuckle Joint given Shear Stress in Eye

$$\text{fx } d = d_o - \frac{L}{b \cdot \tau_{\text{eye}}}$$

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

$$\text{ex } 27.91667\text{mm} = 80\text{mm} - \frac{50000\text{N}}{40\text{mm} \cdot 24\text{N/mm}^2}$$



9) Diameter of Pin of Knuckle Joint given Shear Stress in Fork

$$fx \quad d = d_o - \frac{L}{2 \cdot \tau_{fork} \cdot a}$$

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

$$ex \quad 41.53846mm = 80mm - \frac{50000N}{2 \cdot 25N/mm^2 \cdot 26mm}$$

10) Diameter of Pin of Knuckle Joint given Tensile Stress in Eye

$$fx \quad d = d_o - \frac{L}{b \cdot (\sigma_{t eye})}$$

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

$$ex \quad 52.22222mm = 80mm - \frac{50000N}{40mm \cdot 45N/mm^2}$$

11) Diameter of Pin of Knuckle Joint given Tensile Stress in Fork

$$fx \quad d = d_o - \frac{L}{2 \cdot (\sigma_{t fork}) \cdot a}$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 43.71553mm = 80mm - \frac{50000N}{2 \cdot 26.5N/mm^2 \cdot 26mm}$$

12) Diameter of Pinhead of Knuckle Joint given Diameter of Pin

$$fx \quad d_1 = 1.5 \cdot d$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 55.5mm = 1.5 \cdot 37mm$$



13) Length of Pin of Knuckle Joint in Contact with Eye End

[Open Calculator !\[\]\(eafc244b53721dd1ec133f0772f70fc7_img.jpg\)](#)

$$fx \quad l = \frac{L}{\sigma_c \cdot d}$$

$$ex \quad 45.04505mm = \frac{50000N}{30N/mm^2 \cdot 37mm}$$







Variables Used

- **a** Thickness of Fork Eye of Knuckle Joint (*Millimeter*)
- **b** Thickness of Eye of Knuckle Joint (*Millimeter*)
- **d** Diameter of Knuckle Pin (*Millimeter*)
- **d₁** Diameter of Knuckle Pin Head (*Millimeter*)
- **d_o** Outer Diameter of Eye of Knuckle Joint (*Millimeter*)
- **l** Length of Knuckle Pin in Eye End (*Millimeter*)
- **L** Load on Knuckle Joint (*Newton*)
- **M_b** Bending Moment in Knuckle Pin (*Newton Millimeter*)
- **σ_b** Bending Stress in Knuckle Pin (*Newton per Square Millimeter*)
- **σ_c** Compressive Stress in Knuckle Pin (*Newton per Square Millimeter*)
- **σ_teye** Tensile Stress in Eye of Knuckle Joint (*Newton per Square Millimeter*)
- **σ_tfork** Tensile Stress in Fork of Knuckle Joint (*Newton per Square Millimeter*)
- **T_{eye}** Shear Stress in Eye of Knuckle Joint (*Newton per Square Millimeter*)
- **T_{fork}** Shear Stress in Fork of Knuckle Joint (*Newton per Square Millimeter*)
- **T_{pin}** Shear Stress in Knuckle Pin (*Newton per Square Millimeter*)



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Torque** in Newton Millimeter (N*mm)
Torque Unit Conversion 
- **Measurement:** **Stress** in Newton per Square Millimeter (N/mm²)
Stress Unit Conversion 



Check other formula lists

- Eye Formulas 
- Pin Formulas 

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