Important Joint Geometry and Dimensions Formulas PDF





FormulaExample with Units
$$d_4 = d_2 + \frac{L}{t_c \cdot \sigma_{c1}}$$
79.9994 mm = 40 mm + $\frac{50000 \text{ N}}{21.478 \text{ mm} \cdot 58.2 \text{ N/mm}^2}$

11) Diameter of socket collar of cotter joint given shear stress in socket Formula 🕝 👘

FormulaExample with Units
$$d_4 = \frac{L}{2 \cdot c \cdot \tau_{so}} + d_2$$
 $80 \, \text{mm} = \frac{50000 \, \text{N}}{2 \cdot 25.0 \, \text{mm} \cdot 25 \, \text{N/mm}^2} + 40 \, \text{mm}$

12) Diameter of Spigot Collar given Rod Diameter Formula 🕝

FormulaExample with UnitsEvaluate Formula
$$d_3 = 1.5 \cdot d$$
 $53.524 \, \text{mm} = 1.5 \cdot 35.6827 \, \text{mm}$

Evaluate Formula

13) Diameter of Spigot of Cotter Joint given Bending Stress in Cotter Formula 🕝

Evaluate Formula

Evaluate Formula

Evaluate Formula

Evaluate Formula 🦳

Evaluate Formula

$$d_2 = 4 \cdot b^2 \cdot \sigma_b \cdot \frac{t_c}{L} - 2 \cdot d_4$$

Example with Units $236.0895 \text{ mm} = 4 \cdot 48.5 \text{ mm}^2 \cdot 98 \text{ N/mm}^2 \cdot \frac{21.478 \text{ mm}}{50000 \text{ N}} - 2 \cdot 80 \text{ mm}$

14) Diameter of Spigot of Cotter Joint given Compressive Stress Formula 🕝



15) Diameter of Spigot of Cotter Joint given Shear Stress in Spigot Formula 🕝 👘

Formula	Example with Units	
d – L	39 9996 mm - 50000 N	
$u_2 = \frac{1}{2 \cdot L_a \cdot \tau_{sp}}$	$\frac{35.5550 \text{mm}^2}{2 \cdot 23.5 \text{mm}^2 \cdot 26.596 \text{N/mm}^2}$	

16) Inside Diameter of Socket of Cotter Joint given Shear Stress in Socket Formula 🕝

Formula Example with Units	
$d_2 = d_4 - \frac{L}{2 \cdot c \cdot \tau_{so}}$	$40\text{mm} = 80\text{mm} - \frac{50000\text{N}}{2 \cdot 25.0\text{mm} \cdot 25\text{N/mm}^2}$

17) Minimum Diameter of Spigot in Cotter Joint Subjected to Crushing Stress Formula 🕝



18) Minimum Rod Diameter in Cotter Joint given Axial Tensile Force and Stress Formula 🕝



19) Thickness of Cotter given Compressive Stress in Socket Formula 🕝

Formula	Example with Units	Evaluate Formula (
$t_{c} = \frac{L}{\left(d_{4} - d_{2} \right) \cdot \sigma_{cso}}$	$21.4777 \mathrm{mm} = \frac{50000 \mathrm{N}}{\left(80 \mathrm{mm} - 40 \mathrm{mm} \right) \cdot 58.20 \mathrm{N/mm^2}}$	





$$10.845 \,\mathrm{mm} = \left(2 \cdot 80 \,\mathrm{mm} + 40 \,\mathrm{mm}\right) \cdot \left(\frac{50000 \,\mathrm{N}}{4 \cdot 48.5 \,\mathrm{mm}^2 \cdot 98 \,\mathrm{N/mm^2}}\right)$$

25) Thickness of Spigot Collar when Rod Diameter is Available Formula

Formula	Example with Units
$t_1 = 0.45 \cdot d$	$16.0572\text{mm}\ = 0.45\cdot35.6827\text{mm}$



ula 🗖

26) Width of Cotter by Bending Consideration Formula

Evaluate Formula

 $b = \left(3 \cdot \frac{L}{t_{c} \cdot \sigma_{b}} \cdot \left(\frac{d_{2}}{4} + \frac{d_{4} \cdot d_{2}}{6}\right)\right)^{0.5}$

Example with Units

$$34.4636\,\text{mm} = \left(3 \cdot \frac{50000\,\text{N}}{21.478\,\text{mm} \cdot 98\,\text{N/mm}^2} \cdot \left(\frac{40\,\text{mm}}{4} + \frac{80\,\text{mm} \cdot 40\,\text{mm}}{6}\right)\right)^{0.5}$$

27) Width of Cotter by Shear Consideration Formula

Formula	Example with Units
v v	23.0856 mm = 23800 N
$\mathbf{D} = \frac{1}{2 \cdot \tau_{\rm co} \cdot t_{\rm c}}$	$23.0830 \text{ mm} = \frac{1}{2 \cdot 24 \text{ N/mm}^2 \cdot 21.478 \text{ mm}}$



Variables used in list of Joint Geometry and Dimensions Formulas above

- A Cross Sectional Area of Socket (Square Millimeter)
- A_s Cross Sectional Area of Spigot (Square Millimeter)
- **b** Mean Width of Cotter (Millimeter)
- **C** Axial Distance From Slot to End of Socket Collar (*Millimeter*)
- d Diameter of Rod of Cotter Joint (Millimeter)
- d1 Outside Diameter of Socket (Millimeter)
- d₂ Diameter of Spigot (Millimeter)
- d₃ Diameter of Spigot Collar (Millimeter)
- d₄ Diameter of Socket Collar (Millimeter)
- F_c Force on Cotter Joint (Newton)
- L Load on Cotter Joint (Newton)
- L_a Gap between End of Slot to End of Spigot (*Millimeter*)
- t₁ Thickness of Spigot Collar (Millimeter)
- t_c Thickness of Cotter (Millimeter)
- V Shear Force on Cotter (Newton)
- σ_b Bending Stress in Cotter (Newton per Square Millimeter)
- σ_c Crushing Stress induced in Cotter (Newton per Square Millimeter)
- σ_{c1} Compressive Stress in Spigot (Newton per Square Millimeter)
- σ_{cso} Compressive Stress In Socket (Newton per Square Millimeter)
- σ_tso Tensile Stress In Socket (Newton per Square Millimeter)
- ot_{rod} Tensile Stress in Cotter Joint Rod (Newton per Square Millimeter)
- T_{co} Shear Stress in Cotter (Newton per Square Millimeter)

Constants, Functions, Measurements used in list of Joint Geometry and Dimensions Formulas above

- constant(s): pi,
 3.14159265358979323846264338327950288
 Archimedes' constant
- Functions: 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: Area in Square Millimeter (mm²) Area Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm²) Stress Unit Conversion

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- T_{SO} Shear Stress in Socket (Newton per Square Millimeter)
- T_{sp} Shear Stress in Spigot (Newton per Square *Millimeter*)

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