

Important Soderberg and Goodman Lines Formulas PDF



Formulas Examples with Units

List of 15 Important Soderberg and Goodman Lines Formulas

1) Goodman Line Amplitude Stress Formula

Formula

$$\sigma_a = S_e \cdot \left(1 - \frac{\sigma_m}{\sigma_{ut}} \right)$$

Example with Units

$$30 \text{ N/mm}^2 = 33.84615 \text{ N/mm}^2 \cdot \left(1 - \frac{50 \text{ N/mm}^2}{440 \text{ N/mm}^2} \right)$$

Evaluate Formula 

2) Goodman Line Endurance Limit Formula

Formula

$$S_e = \frac{\sigma_a}{1 - \frac{\sigma_m}{\sigma_{ut}}}$$

Example with Units

$$33.8462 \text{ N/mm}^2 = \frac{30 \text{ N/mm}^2}{1 - \frac{50 \text{ N/mm}^2}{440 \text{ N/mm}^2}}$$

Evaluate Formula 

3) Goodman Line Mean Stress Formula

Formula

$$\sigma_m = \sigma_{ut} \cdot \left(1 - \frac{\sigma_a}{S_e} \right)$$

Example with Units

$$50 \text{ N/mm}^2 = 440 \text{ N/mm}^2 \cdot \left(1 - \frac{30 \text{ N/mm}^2}{33.84615 \text{ N/mm}^2} \right)$$

Evaluate Formula 

4) Goodman Line Ultimate Tensile Strength Formula

Formula

$$\sigma_{ut} = \frac{\sigma_m}{1 - \frac{\sigma_a}{S_e}}$$

Example with Units

$$440.0004 \text{ N/mm}^2 = \frac{50 \text{ N/mm}^2}{1 - \frac{30 \text{ N/mm}^2}{33.84615 \text{ N/mm}^2}}$$

Evaluate Formula 

5) Limiting Value of Mean Stress Formula

Formula

$$S_m = f_s \cdot \sigma_m$$

Example with Units

$$100 \text{ N/mm}^2 = 2 \cdot 50 \text{ N/mm}^2$$

Evaluate Formula 

6) Limiting Value of Stress Amplitude Formula

Formula

$$S_a = f_s \cdot \sigma_a$$

Example with Units

$$60 \text{ N/mm}^2 = 2 \cdot 30 \text{ N/mm}^2$$

Evaluate Formula 



7) Permissible Mean Stress for Fluctuating Load Formula

Formula

$$\sigma_m = \frac{S_m}{f_s}$$

Example with Units

$$50 \text{ N/mm}^2 = \frac{100 \text{ N/mm}^2}{2}$$

Evaluate Formula 

8) Permissible Stress Amplitude for Fluctuating Load Formula

Formula

$$\sigma_a = \frac{S_a}{f_s}$$

Example with Units

$$30 \text{ N/mm}^2 = \frac{60 \text{ N/mm}^2}{2}$$

Evaluate Formula 

9) Slope of Line OE in Modified Goodman Diagram given Bending Amplitude and Mean Bending Moment Formula

Formula

$$m = \frac{M_{ba}}{M_{bm}}$$

Example with Units

$$0.6 = \frac{720 \text{ N*mm}}{1200 \text{ N*mm}}$$

Evaluate Formula 

10) Slope of Line OE in Modified Goodman Diagram given Force Amplitude and Mean Force Formula

Formula

$$m = \frac{P_a}{P_m}$$

Example with Units

$$0.6 = \frac{45.6 \text{ N}}{76 \text{ N}}$$

Evaluate Formula 

11) Slope of Line OE in Modified Goodman Diagram given Stress Amplitude and Mean Stress Formula

Formula

$$m = \frac{\sigma_a}{\sigma_m}$$

Example with Units

$$0.6 = \frac{30 \text{ N/mm}^2}{50 \text{ N/mm}^2}$$

Evaluate Formula 

12) Soderberg Line Amplitude Stress Formula

Formula

$$\sigma_a = S_e \cdot \left(1 - \frac{\sigma_m}{\sigma_{yt}} \right)$$

Example with Units

$$30 \text{ N/mm}^2 = 33.84615 \text{ N/mm}^2 \cdot \left(1 - \frac{50 \text{ N/mm}^2}{440.0004 \text{ N/mm}^2} \right)$$

Evaluate Formula 

13) Soderberg Line Endurance Limit Formula

Formula

$$S_e = \frac{\sigma_a}{1 - \frac{\sigma_m}{\sigma_{yt}}}$$

Example with Units

$$33.8461 \text{ N/mm}^2 = \frac{30 \text{ N/mm}^2}{1 - \frac{50 \text{ N/mm}^2}{440.0004 \text{ N/mm}^2}}$$

Evaluate Formula 



14) Soderberg Line Mean stress Formula

Formula

$$\sigma_m = \sigma_{yt} \cdot \left(1 - \frac{\sigma_a}{S_e} \right)$$

Example with Units

$$50 \text{ N/mm}^2 = 440.0004 \text{ N/mm}^2 \cdot \left(1 - \frac{30 \text{ N/mm}^2}{33.84615 \text{ N/mm}^2} \right)$$

Evaluate Formula 

15) Soderberg Line Tensile Yield Strength Formula

Formula

$$\sigma_{yt} = \frac{\sigma_m}{1 - \frac{\sigma_a}{S_e}}$$

Example with Units

$$440.0004 \text{ N/mm}^2 = \frac{50 \text{ N/mm}^2}{1 - \frac{30 \text{ N/mm}^2}{33.84615 \text{ N/mm}^2}}$$




Evaluate Formula 



Variables used in list of Soderberg and Goodman Lines Formulas above

- f_s Design Factor of Safety
- m Slope of modified Goodman Line
- M_{ba} Bending Moment Amplitude (*Newton Millimeter*)
- M_{bm} Mean Bending Moment (*Newton Millimeter*)
- P_a Force Amplitude for Fluctuating Stress (*Newton*)
- P_m Mean Force for Fluctuating Stress (*Newton*)
- S_a Limiting Value of Stress Amplitude (*Newton per Square Millimeter*)
- S_e Endurance Limit (*Newton per Square Millimeter*)
- S_m Limiting Value of Mean Stress (*Newton per Square Millimeter*)
- σ_a Stress Amplitude for Fluctuating Load (*Newton per Square Millimeter*)
- σ_m Mean Stress for Fluctuating Load (*Newton per Square Millimeter*)
- σ_{ut} Ultimate Tensile strength (*Newton per Square Millimeter*)
- σ_{yt} Tensile Yield Strength for Fluctuating load (*Newton per Square Millimeter*)

Constants, Functions, Measurements used in list of Soderberg and Goodman Lines Formulas above

- **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 



Download other Important Machine Design PDFs

- [Important Power Screws Formulas](#) 
- [Important Design of Keys Formulas](#) 
- [Important Castigliano's Theorem for Deflection in Complex Structures Formulas](#) 
- [Important Design of Lever Formulas](#) 
- [Important Design of Pressure Vessels Formulas](#) 
- [Important Design of Belt Drives Formulas](#) 
- [Important Design of Rolling Contact Bearing Formulas](#) 

Try our Unique Visual Calculators

-  [Winning percentage](#) 
-  [LCM of two numbers](#) 
-  [Mixed fraction](#) 

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

12/5/2024 | 5:00:16 AM UTC

