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Constant Wear Theory Formulas

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List of 13 Constant Wear Theory Formulas

Constant Wear Theory

1) Axial Force on Clutch from Constant Wear Theory given Friction Torque

$$fx \quad P_a = 4 \cdot \frac{M_T}{\mu \cdot (d_o + d_i)}$$

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

$$ex \quad 15900N = 4 \cdot \frac{238500N \cdot mm}{0.2 \cdot (200mm + 100mm)}$$

2) Axial Force on Clutch from Constant Wear Theory given Permissible Intensity of Pressure

$$fx \quad P_a = \pi \cdot p_a \cdot d_i \cdot \frac{d_o - d_i}{2}$$

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

$$ex \quad 15899.99N = \pi \cdot 1.012225N/mm^2 \cdot 100mm \cdot \frac{200mm - 100mm}{2}$$


3) Axial Force on Cone Clutch from Constant Wear Theory given Permissible Pressure Intensity

$$fx \quad P_a = \pi \cdot p_a \cdot d_i \cdot \frac{d_o - d_i}{2}$$

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

$$ex \quad 15899.99N = \pi \cdot 1.012225N/mm^2 \cdot 100mm \cdot \frac{200mm - 100mm}{2}$$



4) Axial Force on Cone Clutch from Constant Wear Theory given Pressure 

$$fx \quad P_a = \pi \cdot P_p \cdot \frac{(d_o^2) - (d_i^2)}{4}$$

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


$$ex \quad 15900.78N = \pi \cdot 0.67485N/mm^2 \cdot \frac{((200mm)^2) - ((100mm)^2)}{4}$$

5) Coefficient of Friction of Clutch from Constant Wear Theory 

$$fx \quad \mu = 8 \cdot \frac{M_T}{\pi \cdot p_a \cdot d_i \cdot ((d_o^2) - (d_i^2))}$$

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

$$ex \quad 0.2 = 8 \cdot \frac{238500N*mm}{\pi \cdot 1.012225N/mm^2 \cdot 100mm \cdot (((200mm)^2) - ((100mm)^2))}$$

6) Coefficient of Friction of Clutch from Constant Wear Theory given Axial Force 

$$fx \quad \mu = 4 \cdot \frac{M_T}{P_a \cdot (d_o + d_i)}$$

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

$$ex \quad 0.2 = 4 \cdot \frac{238500N*mm}{15900N \cdot (200mm + 100mm)}$$

7) Friction Torque on Clutch from Constant Wear Theory given Diameters 

$$fx \quad M_T = \mu \cdot P_a \cdot \frac{d_o + d_i}{4}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 238500N*mm = 0.2 \cdot 15900N \cdot \frac{200mm + 100mm}{4}$$



8) Friction Torque on Cone Clutch from Constant Wear Theory given Axial Force 

$$f_x M_T = \mu \cdot P_m \cdot \frac{d_o + d_i}{4 \cdot \sin(\alpha)}$$

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


$$ex \quad 238500.8N*mm = 0.2 \cdot 15900.03N \cdot \frac{200mm + 100mm}{4 \cdot \sin(89.9^\circ)}$$

9) Friction Torque on Cone Clutch from Constant Wear Theory given Semi-Cone Angle 

$$f_x M_T = \pi \cdot \mu \cdot p_a \cdot d_i \cdot \frac{(d_o^2) - (d_i^2)}{8 \cdot \sin(\alpha)}$$

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


$$ex \quad 238500.3N*mm = \pi \cdot 0.2 \cdot 1.012225N/mm^2 \cdot 100mm \cdot \frac{((200mm)^2) - ((100mm)^2)}{8 \cdot \sin(89.9^\circ)}$$

10) Friction Torque on Multiple Disk Clutch from Constant Wear Theory 

$$f_x M_T = \mu \cdot P_m \cdot z \cdot \frac{d_o + d_i}{4}$$

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

$$ex \quad 238524.3N*mm = 0.2 \cdot 15900.03N \cdot 1.0001 \cdot \frac{200mm + 100mm}{4}$$

11) Frictional Torque on Clutch from Constant Wear Theory given Diameters 

$$f_x M_T = \pi \cdot \mu \cdot p_a \cdot d_i \cdot \frac{(d_o^2) - (d_i^2)}{8}$$

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 238499.9N*mm = \pi \cdot 0.2 \cdot 1.012225N/mm^2 \cdot 100mm \cdot \frac{((200mm)^2) - ((100mm)^2)}{8}$$



12) Permissible Pressure Intensity on Clutch from Constant Wear Theory given Axial Force

[Open Calculator !\[\]\(bd1a142de767a21e5362c595f844a4ff_img.jpg\)](#)

$$fx \quad p_a = 2 \cdot \frac{P_a}{\pi \cdot d_i \cdot (d_o - d_i)}$$

$$ex \quad 1.012225 \text{N/mm}^2 = 2 \cdot \frac{15900 \text{N}}{\pi \cdot 100 \text{mm} \cdot (200 \text{mm} - 100 \text{mm})}$$

13) Permissible Pressure Intensity on Clutch from Constant Wear Theory given Friction Torque

[Open Calculator !\[\]\(830769b31eeeaca920791081939ff8ba_img.jpg\)](#)

$$fx \quad p_a = 8 \cdot \frac{M_T}{\pi \cdot \mu \cdot d_i \cdot ((d_o^2) - (d_i^2))}$$

$$ex \quad 1.012225 \text{N/mm}^2 = 8 \cdot \frac{238500 \text{N} \cdot \text{mm}}{\pi \cdot 0.2 \cdot 100 \text{mm} \cdot ((200 \text{mm})^2 - ((100 \text{mm})^2))}$$








Variables Used

- d_i Inner Diameter of Clutch (Millimeter)
- d_o Outer Diameter of Clutch (Millimeter)
- M_T Friction Torque on Clutch (Newton Millimeter)
- p_a Permissible Intensity of Pressure in Clutch (Newton per Square Millimeter)
- P_a Axial Force for Clutch (Newton)
- P_m Operating Force for Clutch (Newton)
- P_p Pressure between Clutch Plates (Newton per Square Millimeter)
- z Pairs of Contacting Surface of Clutch
- α Semi-Cone Angle of Clutch (Degree)
- μ Coefficient of Friction Clutch



Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **sin**, $\sin(\text{Angle})$
Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Pressure** in Newton per Square Millimeter (N/mm²)
Pressure Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Angle** in Degree (°)
Angle Unit Conversion 
- **Measurement:** **Torque** in Newton Millimeter (N*mm)
Torque Unit Conversion 



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