Important Constant Pressure Theory Formulas PDF

Formulas
Examples
with Units

List of 12
Important Constant Pressure Theory Formulas

1) Axial Force on Clutch from Constant Pressure Theory given Fiction Torque and Diameter Formula

Evaluate Formula

Formula

$$P_a = M_T \cdot \frac{3 \cdot \left({d_o}^2 - {d_{i\ clutch}}^2 \right)}{\mu \cdot \left({d_o}^3 - {d_{i\ clutch}}^3 \right)}$$

Example with Units

$$15332.1429\,\text{N} = 238.5\,\text{N*m} \cdot \frac{3 \cdot \left({200\,\text{mm}}^2 - {100\,\text{mm}}^2 \right)}{0.2 \cdot \left({200\,\text{mm}}^3 - {100\,\text{mm}}^3 \right)}$$

2) Axial Force on Clutch from Constant Pressure Theory given Pressure Intensity and Diameter Formula

Evaluate Formula

Formula

$$P_a = \pi \cdot P_p \cdot \frac{\left({d_o}^2 \right) - \left({d_{i\ clutch}}^2 \right)}{4}$$

Example with Units

$$15332.1345\,\text{N} = 3.1416 \cdot 0.650716\,\text{N/mm}^2 \cdot \frac{\left({200\,\text{mm}}^2 \right) - \left({100\,\text{mm}}^2 \right)}{4}$$

3) Coefficient of Friction for Clutch from Constant Pressure Theory given Diameters Formula

Evaluate Formula

Formula

$$\mu = 12 \cdot \frac{M_T}{\pi \cdot P_p \cdot \left(\left({d_o}^3 \right) - \left({d_{i\ clutch}}^3 \right) \right)}$$

Example with Units

$$0.2 = 12 \cdot \frac{238.5\,\text{N*m}}{3.1416 \cdot 0.650716\,\text{N/mm}^2 \cdot \left(\left({200\,\text{mm}}^3 \right) - \left({100\,\text{mm}}^3 \right) \right)}$$

4) Coefficient of Friction of Clutch from Constant Pressure Theory given Friction Torque Formula

Evaluate Formula

Formula

$$\mu = M_T \cdot \frac{3 \cdot \left(\left(d_o^{\,2} \right) - \left(d_{i\,clutch}^{\,2} \right) \right)}{P_a \cdot \left(\left(d_o^{\,3} \right) - \left(d_{i\,clutch}^{\,3} \right) \right)}$$

Example with Units

$$0.2 = 238.5\,\text{N*m} \cdot \frac{3 \cdot \left(\left(200\,\text{mm}^{\,2} \right) - \left(100\,\text{mm}^{\,2} \right) \right)}{15332.14\,\text{N} \cdot \left(\left(200\,\text{mm}^{\,3} \right) - \left(100\,\text{mm}^{\,3} \right) \right)}$$

5) Collar Friction Torque in Accordance of Uniform Pressure Theory Formula

Evaluate Formula

Formula

$$T_c = \frac{\left(\mu_f \cdot W_{load} \right) \cdot \left(d_0^{\,3} - d_{i\,coller}^{\,3} \right)}{3 \cdot \left(d_0^{\,2} - d_{i\,coller}^{\,2} \right)}$$

Example with Units

$$47.12\,\text{N*m} = \frac{\left(0.3 \cdot 3600\,\text{N} \right) \cdot \left(120\,\text{mm}^{\,3} - 42\,\text{mm}^{\,3} \right)}{3 \cdot \left(120\,\text{mm}^{\,2} - 42\,\text{mm}^{\,2} \right)}$$

6) Friction Torque on Clutch from Constant Pressure Theory given Axial Force Formula

Evaluate Formula

Formula

$$M_T = \mu \cdot P_a \cdot \frac{\left(d_o^{\,3} \right) - \left(d_{i\,clutch}^{\,3} \right)}{3 \cdot \left(\left(d_o^{\,2} \right) - \left(d_{i\,clutch}^{\,2} \right) \right)}$$

Example with Units

$$238.5\,\text{N*m} = 0.2 \cdot 15332.14\,\text{N} \cdot \frac{\left(200\,\text{mm}^{\,3} \right) - \left(100\,\text{mm}^{\,3} \right)}{3 \cdot \left(\left(200\,\text{mm}^{\,2} \right) - \left(100\,\text{mm}^{\,2} \right) \right)}$$

7) Friction Torque on Clutch from Constant Pressure Theory given Pressure Formula

Evaluate Formula

Formula

$$M_T = \pi \cdot \mu \cdot P_p \cdot \frac{\left(d_o^{\,3} \right) - \left(d_{i\,clutch}^{\,3} \right)}{12}$$

Example with Units

$$238.4999\,\text{N*m} = 3.1416 \cdot 0.2 \cdot 0.650716\,\text{N/mm}^2 \cdot \frac{\left(200\,\text{mm}^{\,3} \right) - \left(100\,\text{mm}^{\,3} \right)}{12}$$

8) Friction Torque on Cone Clutch from Constant Pressure Theory Formula

Evaluate Formula

Formula

$$M_T = \pi \cdot \mu \cdot P_c \cdot \frac{\left(d_o^{\,3}\right) - \left(d_{i\ clutch}^{\,3}\right)}{12 \cdot \left(\sin\left(\alpha\right)\right)}$$

Example with Units

$$238.5034\,\text{N*m} = 3.1416 \cdot 0.2 \cdot 0.14\,\text{N/mm²} \cdot \frac{\left(200\,\text{mm}^{\,3}\right) - \left(100\,\text{mm}^{\,3}\right)}{12 \cdot \left(\sin\left(12.424°\right)\right)}$$

9) Friction Torque on Cone Clutch from Constant Pressure Theory given Axial Force Formula

Evaluate Formula

Formula

$$M_T = \mu \cdot P_m \cdot \frac{\left(d_o^{\,3}\right) - \left(d_{i\ clutch}^{\,3}\right)}{3 \cdot \left(\sin\left(\alpha\right)\right) \cdot \left(\left(d_o^{\,2}\right) - \left(d_{i\ clutch}^{\,2}\right)\right)}$$

Example with Units

$$238.5054\,\text{N*m} = 0.2 \cdot 3298.7\,\text{N} \cdot \frac{\left(200\,\text{mm}^{\,3}\right) - \left(100\,\text{mm}^{\,3}\right)}{3 \cdot \left(\sin\left(12.424°\right)\right) \cdot \left(\left(200\,\text{mm}^{\,2}\right) - \left(100\,\text{mm}^{\,2}\right)\right)}$$

10) Friction Torque on Multiple Disk Clutch from Constant Pressure Theory Formula

Evaluate Formula

Formula

$$M_T = \mu \cdot P_m \cdot z \cdot \frac{\left(d_o^{\,3}\right) - \left(d_{i\ clutch}^{\,3}\right)}{3 \cdot \left(\left(d_o^{\,2}\right) - \left(d_{i\ clutch}^{\,2}\right)\right)}$$

Example with Units

$$238.5547\,\text{N*m} = 0.2 \cdot 3298.7\,\text{N} \cdot 4.649 \cdot \frac{\left(200\,\text{mm}^{\,3}\right) - \left(100\,\text{mm}^{\,3}\right)}{3 \cdot \left(\left(200\,\text{mm}^{\,2}\right) - \left(100\,\text{mm}^{\,2}\right)\right)}$$

11) Pressure on Clutch Plate from Constant Pressure Theory given Axial Force Formula

Evaluate Formula

Formula

$$P_p = 4 \cdot \frac{P_a}{\pi \cdot \left(\left(d_o^{\,2}\right) - \left(d_{i\ clutch}^{\,2}\right)\right)}$$

Example with Units

$$0.6507\,\text{N/mm²} = 4 \cdot \frac{15332.14\,\text{N}}{3.1416 \cdot \left(\left(200\,\text{mm}^{\,2}\right) - \left(100\,\text{mm}^{\,2}\right)\right)}$$

12) Pressure on Clutch Plate from Constant Pressure Theory given Friction Torque Formula

Evaluate Formula

Formula

$$P_p = 12 \cdot \frac{M_T}{\pi \cdot \mu \cdot \left(\left(d_o^{\,3} \right) - \left(d_{i\ clutch}^{\,3} \right) \right)}$$

Example with Units

$$0.6507\ \text{N/mm}^2 = 12 \cdot \frac{238.5\ \text{N*m}}{3.1416 \cdot 0.2 \cdot \left(\left(200\ \text{mm}^{\,3} \right) - \left(100\ \text{mm}^{\,3} \right) \right)}$$

Variables used in list of Constant Pressure Theory Formulas above

- d_0 Outer Diameter of Collar *(Millimeter)*
- $d_{i\ clutch}$ Inner Diameter of Clutch *(Millimeter)*
- $d_{i\ coller}$ Inner Diameter of Collar *(Millimeter)*
- d_o Outer Diameter of Clutch *(Millimeter)*
- M_T Friction Torque on Clutch *(Newton Meter)*
- P_a Axial Force for Clutch *(Newton)*
- P_c Constant Pressure between Clutch Plates *(Newton per Square Millimeter)*
- P_m Operating Force for Clutch *(Newton)*
- P_p Pressure between Clutch Plates *(Newton per Square Millimeter)*
- T_c Collar Friction Torque *(Newton Meter)*
- W_{load} Load *(Newton)*
- z Pairs of Contacting Surface of Clutch
- α Semi-Cone Angle of Clutch *(Degree)*
- μ Coefficient of Friction Clutch
- μ_f Coefficient of Friction

Constants, Functions, Measurements used in list of Constant Pressure Theory Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **sin**, sin(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 Meter (N*m) *Torque Unit Conversion*

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