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Constant Pressure Theory Formulas

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List of 12 Constant Pressure Theory Formulas

Constant Pressure Theory

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

Open Calculator

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

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

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

Open Calculator

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

ex $$15332.13\text{N} = \pi \cdot 0.650716\text{N/mm}^2 \cdot \frac{\left((200\text{mm})^2\right) - \left((100\text{mm})^2\right)}{4}$$

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

Open Calculator

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

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

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

Open Calculator

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

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

5) Collar Friction Torque in Accordance of Uniform Pressure Theory

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

8) Friction Torque on Cone Clutch from Constant Pressure Theory

Open Calculator

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

ex $$238.5034\text{N*m} = \pi \cdot 0.2 \cdot 0.14\text{N/mm}^2 \cdot \frac{\left((200\text{mm})^3\right) - \left((100\text{mm})^3\right)}{12 \cdot (\sin(12.424^\circ))}$$

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

ex $$0.650716\text{N/mm}^2 = 4 \cdot \frac{15332.14\text{N}}{\pi \cdot \left(\left((200\text{mm})^2\right) - \left((100\text{mm})^2\right)\right)}$$

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

Open Calculator

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

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

Variables Used

- 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

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **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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