Important Hydrostatic Step Bearing with Pad Formulas PDF

Formulas
Examples
with Units

List of 10
Important Hydrostatic Step Bearing with Pad Formulas

1) Dimension b of Slot given Flow of Lubricant Formula

Evaluate Formula

Formula

$$b = l \cdot 12 \cdot \mu_l \cdot \frac{Q_{slot}}{\left(h^3\right) \cdot \Delta P}$$

Example with Units

$$46.5882\,\text{mm} = 48\,\text{mm} \cdot 12 \cdot 220\,\text{cP} \cdot \frac{15\,\text{mm}^3/\text{s}}{\left(0.02\,\text{mm}^3\right) \cdot 5.1\,\text{MPa}}$$

2) Dimension X in Terms of Total Projected Area of Bearing Pad Formula

Evaluate Formula

Formula

$$X = \frac{A_p}{Y}$$

Example with Units

$$32.1429\,\text{mm} = \frac{450\,\text{mm}^2}{14\,\text{mm}}$$

3) Dimension Y in Terms of Total Projected Area of Bearing Pad Formula

Evaluate Formula

Formula

$$Y = \frac{A_p}{X}$$

Example with Units

$$14.0625\,\text{mm} = \frac{450\,\text{mm}^2}{32\,\text{mm}}$$

4) Flow Coefficient in Terms of Flow of Lubricant through Pad Formula

Evaluate Formula

Formula

$$q_f = Q \cdot A_p \cdot \frac{\mu_l}{W \cdot h^3}$$

Example with Units

$$11 = 1600\,\text{mm}^3/\text{s} \cdot 450\,\text{mm}^2 \cdot \frac{220\,\text{cP}}{1800\,\text{N} \cdot 0.02\,\text{mm}^3}$$

5) Flow of Lubricant through slot in Terms of Pressure Difference Formula

Evaluate Formula

Formula

$$Q_{slot} = \Delta P \cdot b \cdot \frac{h^3}{12 \cdot \mu_l \cdot l}$$

Example with Units

$$15\,\text{mm}^3/\text{s} = 5.1\,\text{MPa} \cdot 46.58824\,\text{mm} \cdot \frac{0.02\,\text{mm}^3}{12 \cdot 220\,\text{cP} \cdot 48\,\text{mm}}$$

6) Flow of Lubricating Oil Passing through Pad in Terms of Flow Coefficient Formula

Evaluate Formula

Formula

$$Q = q_f \cdot W \cdot \frac{h^3}{A_p \cdot \mu_l}$$

Example with Units

$$1600\,\text{mm}^3/\text{s} = 11 \cdot 1800\,\text{N} \cdot \frac{0.02\,\text{mm}^3}{450\,\text{mm}^2 \cdot 220\,\text{cP}}$$

7) Length of Slot in Direction of Flow in Terms of Flow of Lubricant Formula

Evaluate Formula

Formula

$$l = \Delta P \cdot b \cdot \frac{h^3}{12 \cdot \mu_l \cdot Q_{slot}}$$

Example with Units

$$48\,\text{mm} = 5.1\,\text{MPa} \cdot 46.58824\,\text{mm} \cdot \frac{0.02\,\text{mm}^3}{12 \cdot 220\,\text{cP} \cdot 15\,\text{mm}^3/\text{s}}$$

8) Total Projected Area of Bearing Pad Formula

Evaluate Formula

Formula

$$A_p = X \cdot Y$$

Example with Units

$$448\,\text{mm}^2 = 32\,\text{mm} \cdot 14\,\text{mm}$$

9) Total Projected Area of Bearing Pad in Terms of Flow of Lubricant Formula

Evaluate Formula

Formula

$$A_p = q_f \cdot W \cdot \frac{h^3}{\mu_l \cdot Q}$$

Example with Units

$$450\,\text{mm}^2 = 11 \cdot 1800\,\text{N} \cdot \frac{0.02\,\text{mm}^3}{220\,\text{cP} \cdot 1600\,\text{mm}^3/\text{s}}$$

10) Total Projected Area of Bearing Pad in Terms of Load acting on Bearing Formula

Evaluate Formula

Formula

$$A_p = \frac{W}{p_r \cdot a_f}$$

Example with Units

$$450.1125\,\text{mm}^2 = \frac{1800\,\text{N}}{4.3\,\text{MPa} \cdot 0.93}$$

Variables used in list of Hydrostatic Step Bearing with Pad Formulas above

- a_f Load Coefficient for Bearing
- A_p Total Projected Area of Bearing Pad *(Square Millimeter)*
- **b** Breadth of Slot for Oil Flow *(Millimeter)*
- **h** Oil Film thickness *(Millimeter)*
- **l** Length of Slot in Direction of Flow *(Millimeter)*
- p_r Pressure of Lubricating Oil *(Megapascal)*
- **Q** Flow of Lubricant *(Cubic Millimeter per Second)*
- q_f Flow Coefficient
- Q_{slot} Flow of Lubricant from Slot *(Cubic Millimeter per Second)*
- **W** Load Acting on Sliding Bearing *(Newton)*
- **X** Dimension X of Bearing Pad *(Millimeter)*
- **Y** Dimension Y of Bearing Pad *(Millimeter)*
- **ΔP** Pressure Difference between Slot Sides *(Megapascal)*
- μ_l Dynamic Viscosity of Lubricant *(Centipoise)*

Constants, Functions, Measurements used in list of Hydrostatic Step Bearing with Pad Formulas above

- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Volumetric Flow Rate** in Cubic Millimeter per Second (mm³/s)
  Volumetric Flow Rate Unit Conversion
- Measurement: **Dynamic Viscosity** in Centipoise (cP)
  Dynamic Viscosity Unit Conversion

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