



Dash Pot Mechanism Formulas

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List of 36 Dash Pot Mechanism Formulas

Dash Pot Mechanism

1) Length of Piston for Pressure Drop over Piston

$$\mathbf{L}_{\mathrm{P}} = rac{\Delta \mathrm{Pf}}{\left(6 \cdot \mu \cdot rac{\mathrm{v}_{\mathrm{piston}}}{\mathrm{C}_{\mathrm{R}}^{3}}
ight) \cdot \left(0.5 \cdot \mathrm{D} + \mathrm{C}_{\mathrm{R}}
ight)}$$

Open Calculator

$$= \frac{33 \text{Pa}}{\left(6 \cdot 10.2 \text{P} \cdot \frac{0.045 \text{m/s}}{\left(0.45 \text{m}\right)^3}\right) \cdot \left(0.5 \cdot 3.5 \text{m} + 0.45 \text{m}\right)}$$

2) Length of Piston for Shear Force Resisting Motion of Piston

$$ext{L}_{P} = rac{ ext{Fs}}{\pi \cdot \mu \cdot v_{piston} \cdot \left(1.5 \cdot \left(rac{D}{C_{R}}
ight)^{2} + 4 \cdot \left(rac{D}{C_{R}}
ight)}
ight)}$$

Open Calculator

$$= \frac{90 \text{N}}{\pi \cdot 10.2 \text{P} \cdot 0.045 \text{m/s} \cdot \left(1.5 \cdot \left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^2 + 4 \cdot \left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)\right)}$$

3) Length of Piston for Vertical Upward Force on Piston

$$\mathbf{F}_{\mathbf{v}}$$

$$\mathrm{L_{P}} = rac{\mathrm{F_{v}}}{\mathrm{v_{piston}} \cdot \pi \cdot \mu \cdot \left(0.75 \cdot \left(\left(rac{\mathrm{D}}{\mathrm{C_{R}}}
ight)^{3}
ight) + 1.5 \cdot \left(\left(rac{\mathrm{D}}{\mathrm{C_{R}}}
ight)^{2}
ight)}$$

$$= \frac{320 \text{N}}{0.045 \text{m/s} \cdot \pi \cdot 10.2 \text{P} \cdot \left(0.75 \cdot \left(\left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^3\right) + 1.5 \cdot \left(\left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^2\right)\right)}$$



4) Pressure Drop over Length of Piston given Vertical Upward Force on Piston

 $\Delta ext{Pf} = rac{ ext{F}_{ ext{v}}}{0.25 \cdot \pi \cdot ext{D} \cdot ext{D}}$

Open Calculator 🗗

ex
$$33.26014$$
Pa = $\frac{320N}{0.25 \cdot \pi \cdot 3.5m \cdot 3.5m}$

5) Pressure Drop over Piston

 $\Delta Pf = \left(6 \cdot \mu \cdot v_{piston} \cdot rac{L_P}{C_D^3}
ight) \cdot (0.5 \cdot D + C_R)$

Open Calculator

6) Pressure Gradient given Rate of Flow

 $\mathrm{d} p | \mathrm{d} r = \left(12 \cdot rac{\mu}{\mathrm{C_p^3}}
ight) \cdot \left(\left(rac{\mathrm{Q}}{\pi} \cdot \mathrm{D}
ight) + \mathrm{v_{piston}} \cdot 0.5 \cdot \mathrm{C_R}
ight)$

Open Calculator

7) Pressure Gradient given Velocity of Flow in Oil Tank

 $\mathrm{d} p | \mathrm{d} r = rac{\mu \cdot 2 \cdot \left(u_{Oiltank} - \left(v_{piston} \cdot rac{R}{C_{H}}
ight)
ight)}{R \cdot R - C_{H} \cdot R}$

$$\boxed{ \mathbf{ex} \\ 50.97758 \mathrm{N/m^3} = \frac{10.2 \mathrm{P} \cdot 2 \cdot \left(12 \mathrm{m/s} - \left(0.045 \mathrm{m/s} \cdot \frac{0.7 \mathrm{m}}{50 \mathrm{mm}}\right)\right)}{0.7 \mathrm{m} \cdot 0.7 \mathrm{m} - 50 \mathrm{mm} \cdot 0.7 \mathrm{m} } }$$



8) Shear Force Resisting Motion of Piston

 $ag{Fs} = \pi \cdot L_{P} \cdot \mu \cdot v_{piston} \cdot \left(1.5 \cdot \left(rac{D}{C_{R}}
ight)^{2} + 4 \cdot \left(rac{D}{C_{R}}
ight)
ight)$

Open Calculator

$$87.85464 \text{N} = \pi \cdot 5 \text{m} \cdot 10.2 \text{P} \cdot 0.045 \text{m/s} \cdot \left(1.5 \cdot \left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^2 + 4 \cdot \left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)\right)$$

9) Total Forces

fx $T_{
m f}=F_{
m v}+F_{
m S}$

Open Calculator

Open Calculator 🚰

410N = 320N + 90N

10) Velocity of Flow in Oil Tank

 $\overline{u_{\mathrm{Oiltank}} = \left(\mathrm{dp} | \mathrm{dr} \cdot 0.5 \cdot rac{\mathrm{R} \cdot \mathrm{R} - \mathrm{C_H} \cdot \mathrm{R}}{\mu}
ight) - \left(v_{\mathrm{piston}} \cdot rac{\mathrm{R}}{\mathrm{C_H}}
ight)}$

ex

fx

$$\boxed{12.75235 \text{m/s} = \left(60 \text{N/m}^3 \cdot 0.5 \cdot \frac{0.7 \text{m} \cdot 0.7 \text{m} - 50 \text{mm} \cdot 0.7 \text{m}}{10.2 \text{P}}\right) - \left(0.045 \text{m/s} \cdot \frac{0.7 \text{m}}{50 \text{mm}}\right)}$$

11) Vertical Force given Total Force

fx $\mathrm{F_v} = \mathrm{Fs} - \mathrm{F_{Total}}$

Open Calculator

87.5N = 90N - 2.5N

12) Vertical Upward Force on Piston given Piston Velocity

12, vertical opward i orde on Fiston given Fiston velocity

$$\boxed{ \begin{aligned} \mathbf{F}_{v} &= L_{P} \cdot \pi \cdot \mu \cdot v_{piston} \cdot \left(0.75 \cdot \left(\left(\frac{D}{C_{R}}\right)^{3}\right) + 1.5 \cdot \left(\left(\frac{D}{C_{R}}\right)^{2}\right) \right) \end{aligned}}$$

ex

$$\boxed{319.849 \text{N} = 5 \text{m} \cdot \pi \cdot 10.2 \text{P} \cdot 0.045 \text{m/s} \cdot \left(0.75 \cdot \left(\left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^3\right) + 1.5 \cdot \left(\left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^2\right)\right)}$$

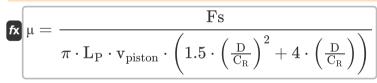
Dynamic Viscosity

13) Dynamic Viscosity for Pressure Reduction over Length of Piston

 $\mu = rac{\Delta Pf}{\left(6 \cdot v_{piston} \cdot rac{L_P}{C_p^3}
ight) \cdot (0.5 \cdot D + C_R)}$

Open Calculator

14) Dynamic Viscosity for Shear Force Resisting Motion of Piston 🗗



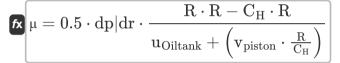
$$= \frac{90 \text{N}}{\pi \cdot 5 \text{m} \cdot 0.045 \text{m/s} \cdot \left(1.5 \cdot \left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^2 + 4 \cdot \left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)\right)}$$

15) Dynamic Viscosity given Rate of Flow

 $\mu = rac{\mathrm{d}p |\mathrm{d}r \cdot rac{C_R^3}{12}}{\left(rac{\mathrm{Q}}{\pi} \cdot \mathrm{D}
ight) + v_{\mathrm{piston}} \cdot 0.5 \cdot C_R}$

Open Calculator 🗗

16) Dynamic Viscosity given Velocity of Flow in Oil Tank

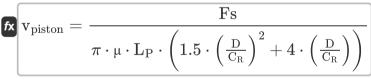


Open Calculator

$$\boxed{ 10.8076 P = 0.5 \cdot 60 N/m^3 \cdot \frac{0.7 m \cdot 0.7 m - 50 mm \cdot 0.7 m}{12 m/s + \left(0.045 m/s \cdot \frac{0.7 m}{50 mm}\right) } }$$

Velocity of Piston 🗗

17) Velocity of Piston for Shear Force Resisting Motion of Piston







18) Velocity of Piston for Vertical Upward Force on Piston

fx

Open Calculator

$$F_{
m piston} = rac{{
m F}_{
m v}}{{
m L}_{
m P} \cdot \pi \cdot \mu \cdot \left(0.75 \cdot \left(\left(rac{
m D}{{
m C}_{
m R}}
ight)^3
ight) + 1.5 \cdot \left(\left(rac{
m D}{{
m C}_{
m R}}
ight)^2
ight)}$$

19) Velocity of Piston given Velocity of Flow in Oil Tank

fx

Open Calculator

$$\mathbf{v}_{\mathrm{piston}} = \left(\left(0.5 \cdot \mathrm{dp} | \mathrm{dr} \cdot \frac{\mathbf{R} \cdot \mathbf{R} - \mathbf{C}_{\mathrm{H}} \cdot \mathbf{R}}{\mu} \right) - \mathbf{u}_{\mathrm{Oiltank}}
ight) \cdot \left(\frac{\mathbf{C}_{\mathrm{H}}}{\mathbf{R}}
ight)
ight)$$

ex

$$\boxed{0.098739 \text{m/s} = \left(\left(0.5 \cdot 60 \text{N/m}^3 \cdot \frac{0.7 \text{m} \cdot 0.7 \text{m} - 50 \text{mm} \cdot 0.7 \text{m}}{10.2 \text{P}} \right) - 12 \text{m/s} \right) \cdot \left(\frac{50 \text{mm}}{0.7 \text{m}} \right)}$$

20) Velocity of Pistons for Pressure Drop over Length of Piston

 $m v_{piston} = rac{1}{\left(6 \cdot \mu \cdot rac{L_{
m P}}{C^3}
ight) \cdot \left(0.5 \cdot D + C_{
m R}
ight)}$



When Piston Velocity is Negligible to Average Velocity of Oil in Clearance Space ☑

21) Clearance given Pressure Drop over Length of Piston

$$\mathrm{C_R} = \left(3\cdot\mathrm{D}\cdot\mu\cdot\mathrm{v_{piston}}\cdotrac{\mathrm{L_P}}{\Delta\mathrm{Pf}}
ight)^{rac{1}{3}}$$

Open Calculator 🗗

22) Clearance given Shear Stress

$$\mathrm{C_H} = \sqrt{1.5 \cdot \mathrm{D} \cdot \mu \cdot rac{v_{\mathrm{piston}}}{ au}}$$

Open Calculator

$$\mathbf{ex}$$
 50.87579mm = $\sqrt{1.5 \cdot 3.5 \text{m} \cdot 10.2 \text{P} \cdot \frac{0.045 \text{m/s}}{93.1 \text{Pa}}}$

23) Diameter of Piston for Pressure Drop over Length

$$ext{D} = \left(rac{\Delta ext{Pf}}{6 \cdot \mu \cdot ext{v}_{ ext{piston}} \cdot rac{ ext{L}_{ ext{P}}}{ ext{C}_{ ext{R}}^3}}
ight) \cdot 2$$

Open Calculator 🛂

$$4.367647 \mathrm{m} = \left(\frac{33 \mathrm{Pa}}{6 \cdot 10.2 \mathrm{P} \cdot 0.045 \mathrm{m/s} \cdot \frac{5 \mathrm{m}}{(0.45 \mathrm{m})^3}}\right) \cdot 2$$

24) Diameter of Piston given Shear Stress

$$D = rac{ au}{1.5 \cdot \mu \cdot rac{ ext{v}_{ ext{piston}}}{ ext{C}_{ ext{H}} \cdot ext{C}_{ ext{H}}}}$$

$$= \frac{93.1 Pa}{1.5 \cdot 10.2 P \cdot \frac{0.045 m/s}{50 mm \cdot 50 mm}}$$





25) Dynamic Viscosity for Pressure Drop over Length

 $\mu = rac{\Delta ext{Pf}}{\left(6 \cdot ext{v}_{ ext{piston}} \cdot rac{ ext{L}_{ ext{P}}}{ ext{C}_{ ext{R}}^3}
ight) \cdot (0.5 \cdot ext{D})}$

Open Calculator

ex
$$12.72857P = \frac{33Pa}{\left(6 \cdot 0.045 \text{m/s} \cdot \frac{5\text{m}}{(0.45\text{m})^3}\right) \cdot (0.5 \cdot 3.5\text{m})}$$

26) Dynamic Viscosity given Shear Stress in Piston

 $\mu = rac{ au}{1.5 \cdot \mathrm{D} \cdot rac{\mathrm{v}_{\mathrm{piston}}}{\mathrm{C}_{\mathrm{H}} \cdot \mathrm{C}_{\mathrm{H}}}}$

Open Calculator 🚰

$$egin{aligned} \mathbf{ex} \ 9.851852P = rac{93.1Pa}{1.5 \cdot 3.5 ext{m} \cdot rac{0.045 ext{m/s}}{50 ext{mm} \cdot 50 ext{mm}} \end{aligned}$$

27) Dynamic Viscosity given Velocity of Fluid 🗗

 $\mu = \mathrm{dp} | \mathrm{dr} \cdot 0.5 \cdot \left(rac{\mathrm{R}^2 - \mathrm{C_H} \cdot \mathrm{R}}{\mathrm{u_{Fluid}}}
ight)$

Open Calculator

ex
$$0.455 ext{P} = 60 ext{N/m}^3 \cdot 0.5 \cdot \left(\frac{\left(0.7 ext{m} \right)^2 - 50 ext{mm} \cdot 0.7 ext{m}}{300 ext{m/s}}
ight)$$

28) Dynamic Viscosity given velocity of piston

 $\mu = rac{F_{Total}}{\pi \cdot v_{piston} \cdot L_{P} \cdot \left(0.75 \cdot \left(\left(rac{D}{C_{R}}
ight)^{3}
ight) + 1.5 \cdot \left(\left(rac{D}{C_{R}}
ight)^{2}
ight)
ight)}$





29) Length of Piston for Pressure Reduction over Length of Piston 🖒

 $\mathbf{L}_{\mathrm{P}} = rac{\Delta \mathrm{Pf}}{\left(6 \cdot \mu \cdot rac{\mathrm{v}_{\mathrm{piston}}}{\mathrm{C_{\mathrm{R}}^3}}
ight) \cdot (0.5 \cdot \mathrm{D})}$

Open Calculator

30) Pressure Drop over Lengths of Piston

 $\Delta ext{Pf} = \left(6 \cdot \mu \cdot v_{piston} \cdot rac{L_P}{C_R^3}
ight) \cdot (0.5 \cdot D)$

Open Calculator

31) Pressure Gradient given Velocity of Fluid

 $\mathrm{d} p | \mathrm{d} r = rac{u_{Oiltank}}{0.5 \cdot rac{R \cdot R - C_H \cdot R}{\mu}}$

Open Calculator

$$\boxed{ 53.8022 \text{N/m}^{_3} = \frac{12 \text{m/s}}{0.5 \cdot \frac{0.7 \text{m} \cdot 0.7 \text{m} - 50 \text{mm} \cdot 0.7 \text{m}}{10.2 \text{P}} } }$$

32) Velocity of Fluid



ex
$$13.38235 \mathrm{m/s} = 60 \mathrm{N/m^3 \cdot 0.5 \cdot \frac{0.7 \mathrm{m} \cdot 0.7 \mathrm{m} - 50 \mathrm{mm} \cdot 0.7 \mathrm{m}}{10.2 \mathrm{P}}}$$



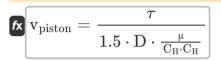
33) Velocity of Piston for Pressure reduction over Length of Piston 🗗

 $extbf{v}_{ ext{piston}} = rac{\Delta ext{Pf}}{\left(3 \cdot \mu \cdot rac{ ext{Lp}}{ ext{C}_{ ext{R}}^3}
ight) \cdot (ext{D})}$

Open Calculator

$$\boxed{ 0.056155 \text{m/s} = \frac{33 \text{Pa}}{\left(3 \cdot 10.2 \text{P} \cdot \frac{5 \text{m}}{\left(0.45 \text{m}\right)^3}\right) \cdot \left(3.5 \text{m}\right) } }$$

34) Velocity of Piston given Shear Stress

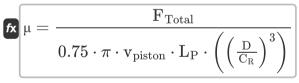


Open Calculator 🚰

$$oxed{ex} 0.043464 ext{m/s} = rac{93.1 ext{Pa}}{1.5 \cdot 3.5 ext{m} \cdot rac{10.2 ext{P}}{50 ext{mm} \cdot 50 ext{mm}}}$$

When Shear Force is Negligible

35) Dynamic Viscosity for Total Force in piston



ex
$$0.100226 P = \frac{2.5 N}{0.75 \cdot \pi \cdot 0.045 m/s \cdot 5 m \cdot \left(\left(\frac{3.5 m}{0.45 m}\right)^3\right)}$$



36) Length of Piston for Total Force in Piston



$$\mathbf{L}_{\mathrm{P}} = rac{\mathbf{F}_{\mathrm{Total}}}{0.75 \cdot \pi \cdot \mu \cdot v_{\mathrm{piston}} \cdot \left(\left(rac{\mathrm{D}}{\mathrm{C}_{\mathrm{R}}}
ight)^{3}
ight)}$$

ex
$$4.913032 \text{m} = \frac{2.5 \text{N}}{0.75 \cdot \pi \cdot 10.2 \text{P} \cdot 0.045 \text{m/s} \cdot \left(\left(\frac{3.5 \text{m}}{0.45 \text{m}}\right)^3\right)}$$





Variables Used

- C_H Hydraulic Clearance (Millimeter)
- C_R Radial Clearance (Meter)
- **D** Diameter of Piston (*Meter*)
- dp|dr Pressure Gradient (Newton per Cubic Meter)
- F_{Total} Total Force in Piston (Newton)
- **F**_v Vertical Component of Force (Newton)
- **Fs** Shear Force (Newton)
- **Lp** Piston Length (*Meter*)
- Q Discharge in Laminar Flow (Cubic Meter per Second)
- R Horizontal Distance (Meter)
- Tf Total Force (Newton)
- **u**Fluid Fluid Velocity (Meter per Second)
- UOiltank Fluid Velocity in Oil Tank (Meter per Second)
- V_{piston} Velocity of Piston (Meter per Second)
- **APf** Pressure Drop due to Friction (Pascal)
- µ Dynamic Viscosity (Poise)
- τ Shear Stress (Pascal)





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Function: sqrt, sqrt(Number)
 A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Meter (m), Millimeter (mm)
 Length Unit Conversion
- Measurement: Pressure in Pascal (Pa)

 Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Volumetric Flow Rate in Cubic Meter per Second (m³/s)

 Volumetric Flow Rate Unit Conversion
- Measurement: Dynamic Viscosity in Poise (P)
 Dynamic Viscosity Unit Conversion
- Measurement: Pressure Gradient in Newton per Cubic Meter (N/m³)
 Pressure Gradient Unit Conversion
- Measurement: Stress in Pascal (Pa)
 Stress Unit Conversion





Check other formula lists

- Dash Pot Mechanism Formulas
- Laminar Flow around a Sphere Stokes'
 Law Formulas
- Laminar Flow between Parallel Flat Plates,
 one plate moving and other at rest,
 Couette Flow Formulas
- Laminar Flow between Parallel Plates, both Plates at Rest Formulas
- Laminar Flow of Fluid in an Open Channel Formulas
- Measurement of Viscosity Viscometers Formulas
- Steady Laminar Flow in Circular Pipes Formulas

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