



Laminar Flow between Parallel Plates, both plates at rest Formulas

Calculators!

Examples!

Conversions!

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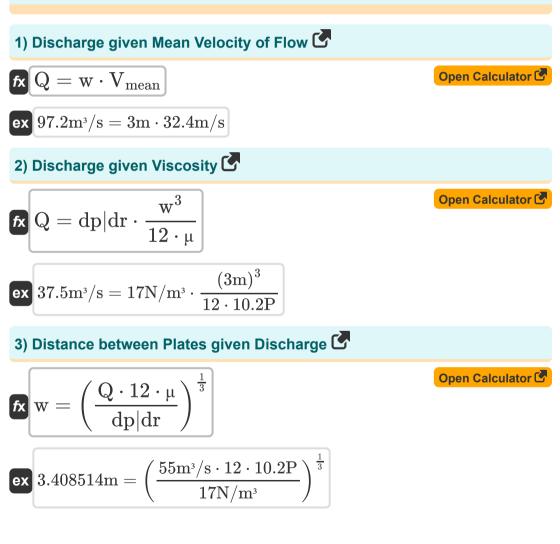
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List of 30 Laminar Flow between Parallel Plates, both plates at rest Formulas

Laminar Flow between Parallel Plates, both plates at rest 🚰



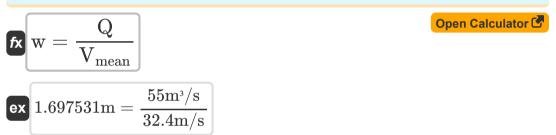


4) Distance between Plates given Maximum Velocity between Plates 🕑

fx
$$w = \sqrt{\frac{8 \cdot \mu \cdot V_{max}}{dp|dr}}$$

ex $2.987976m = \sqrt{\frac{8 \cdot 10.2P \cdot 18.6m/s}{17N/m^3}}$

5) Distance between Plates given Mean Velocity of Flow C



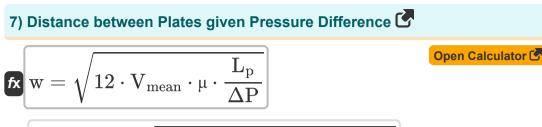
6) Distance between Plates given Mean Velocity of Flow with Pressure Gradient

fx
$$w = \sqrt{\frac{12 \cdot \mu \cdot V_{mean}}{dp|dr}}$$

ex $4.829907m = \sqrt{\frac{12 \cdot 10.2P \cdot 32.4m/s}{17N/m^3}}$







ex
$$1.726782 m = \sqrt{12 \cdot 32.4 m/s \cdot 10.2 P \cdot \frac{0.10 m}{13.3 N/m^2}}$$

8) Distance between Plates given Pressure Head Drop 🗹

 $\begin{aligned} & \mathbf{fx} \mathbf{w} = \sqrt{\frac{12 \cdot \mu \cdot \mathbf{L}_{p} \cdot \mathbf{V}_{mean}}{\gamma_{f} \cdot \mathbf{h}_{location}}} \\ & \mathbf{ex} \end{aligned} \\ & \mathbf{1.458653m} = \sqrt{\frac{12 \cdot 10.2 \mathbf{P} \cdot 0.10 \mathbf{m} \cdot 32.4 \mathbf{m/s}}{9.81 \mathrm{kN/m^{3}} \cdot 1.9 \mathrm{m}}} \end{aligned}$

9) Distance between Plates given Shear Stress Distribution Profile

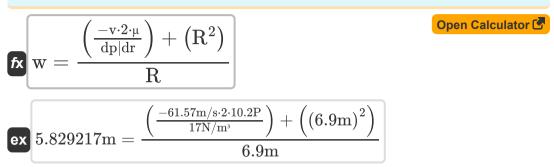
$$f_{X} w = 2 \cdot \left(R - \left(\frac{\tau}{dp | dr} \right) \right)$$

$$e_{X} 2.847059m = 2 \cdot \left(6.9m - \left(\frac{93.1Pa}{17N/m^{3}} \right) \right)$$



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10) Distance between Plates using Velocity Distribution Profile



11) Horizontal Distance given Shear Stress Distribution Profile

fx
$$\mathbf{R} = rac{\mathrm{w}}{2} + \left(rac{ au}{\mathrm{dp}|\mathrm{dr}}
ight)$$

ex
$$6.976471 \text{m} = \frac{3\text{m}}{2} + \left(\frac{93.1 \text{Pa}}{17 \text{N/m}^3}\right)$$

12) Length of Pipe given Pressure Difference 🕑

fx
$$L_p = \frac{\Delta P \cdot w \cdot w}{\mu \cdot 12 \cdot V_{mean}}$$

ex $0.301834m = \frac{13.3N/m^2 \cdot 3m \cdot 3m}{10.2P \cdot 12 \cdot 32.4m/s}$

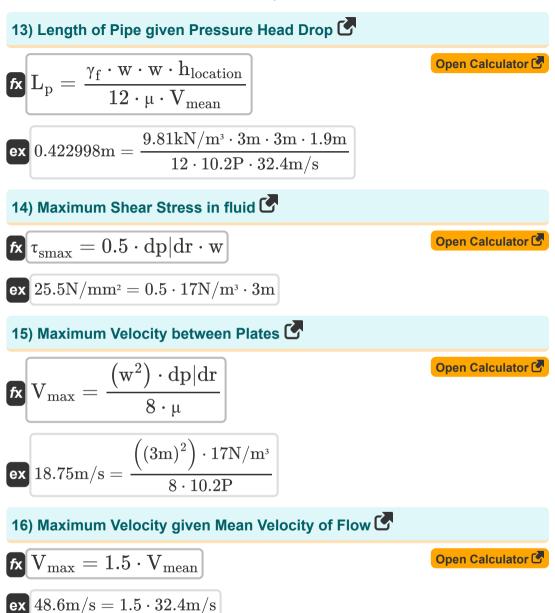
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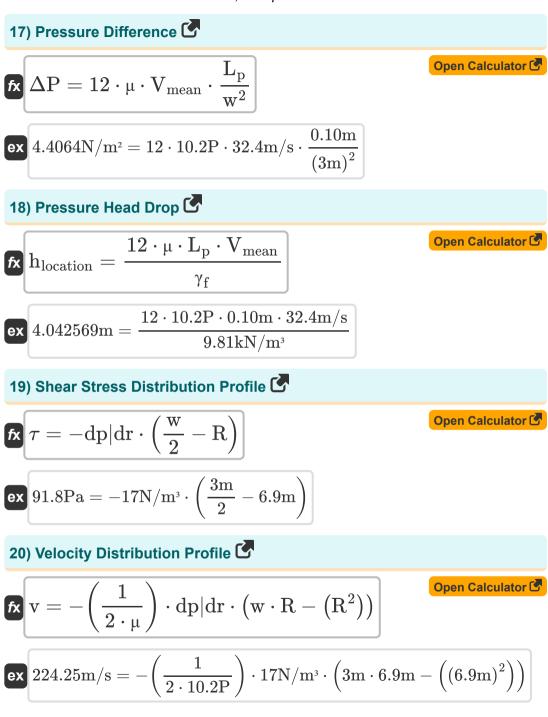


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7/14

Mean Velocity of Flow 🕑

21) Mean Velocity of Flow given Maximum Velocity 🕑

$$f_{X} V_{mean} = \left(\frac{2}{3}\right) \cdot V_{max}$$

$$f_{X} V_{mean} = \left(\frac{2}{3}\right) \cdot 18.6 \text{m/s}$$

$$f_{X} V_{mean} = \frac{\Delta P \cdot w}{12 \cdot \mu \cdot L_{p}}$$

$$f_{X} V_{mean} = \frac{\Delta P \cdot w}{12 \cdot \mu \cdot L_{p}}$$

$$f_{X} V_{mean} = \frac{\Delta P \cdot w}{12 \cdot \mu \cdot L_{p}}$$

$$f_{X} V_{mean} = \frac{\Delta P \cdot w}{12 \cdot \mu \cdot L_{p}}$$

$$f_{X} V_{mean} = \left(\frac{M^{2}}{12 \cdot \mu}\right) \cdot 0.10 \text{m}$$

$$f_{X} V_{mean} = \left(\frac{w^{2}}{12 \cdot \mu}\right) \cdot dp | dr$$

$$f_{X} V_{mean} = \left(\frac{w^{2}}{12 \cdot \mu}\right) \cdot dp | dr$$

$$f_{X} V_{mean} = \left(\frac{(3m)^{2}}{12 \cdot 10.2P}\right) \cdot 17 \text{N/m}^{3}$$

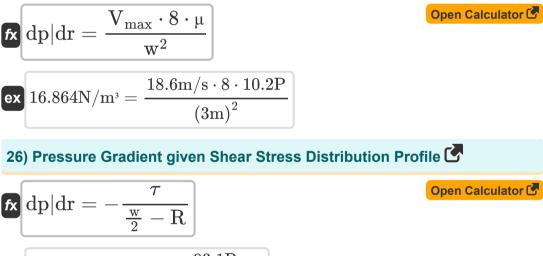




24) Mean Velocity of Flow given Pressure Head Drop 🖸

Pressure Gradient C

25) Pressure Gradient given Maximum Velocity between Plates 🕑



$$17.24074 \mathrm{N/m^3} = -rac{93.1 \mathrm{Pa}}{rac{3\mathrm{m}}{2} - 6.9 \mathrm{m}}$$





10/14

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Dynamic Viscosity 🕑

27) Dynamic Viscosity given Maximum Velocity between Plates 🕑

fx
$$\mu = rac{\left(\mathrm{w}^2
ight)\cdot\mathrm{dp}|\mathrm{dr}}{8\cdot\mathrm{V}_{\mathrm{max}}}$$

ex $10.28226P = rac{\left((3m)^2\right) \cdot 17N/m^3}{8 \cdot 18.6m/s}$

28) Dynamic Viscosity given Mean Velocity of Flow with Pressure Gradient

fx
$$\mu = \left(rac{\mathrm{w}^2}{12 \cdot \mathrm{V}_{\mathrm{mean}}}
ight) \cdot \mathrm{d}p |\mathrm{d}r$$

ex $3.935185\mathrm{P} = \left(rac{(3\mathrm{m})^2}{12 \cdot 32.4\mathrm{m/s}}
ight) \cdot 17\mathrm{N/m^3}$

29) Dynamic Viscosity given Pressure Difference 🕑

fx
$$\mu = rac{\Delta P \cdot w}{12 \cdot V_{mean} \cdot L_{p}}$$

ex $10.26235P = rac{13.3N/m^{2} \cdot 3m}{12 \cdot 32.4m/s \cdot 0.10m}$

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30) Dynamic Viscosity using Velocity Distribution Profile

$$\int \mathbf{k} \left[\mu = \left(\frac{1}{2 \cdot \mathbf{v}} \right) \cdot d\mathbf{p} | d\mathbf{r} \cdot \left(\mathbf{w} \cdot \mathbf{R}^2 \right) \right]$$

$$ex \left[197.1829P = \left(\frac{1}{2 \cdot 61.57 \text{m/s}} \right) \cdot 17N/\text{m}^3 \cdot \left(3\text{m} \cdot (6.9\text{m})^2 \right) \right]$$





Variables Used

- **D**pipe Diameter of Pipe (Meter)
- **dp|dr** Pressure Gradient (Newton per Cubic Meter)
- hlocation Head Loss due to Friction (Meter)
- L_p Length of Pipe (Meter)
- Q Discharge in Laminar Flow (Cubic Meter per Second)
- R Horizontal Distance (Meter)
- S Specific Weight of Liquid in Piezometer (Kilonewton per Cubic Meter)
- V Velocity of Liquid (Meter per Second)
- Vmax Maximum Velocity (Meter per Second)
- Vmean Mean Velocity (Meter per Second)
- W Width (Meter)
- Yf Specific Weight of Liquid (Kilonewton per Cubic Meter)
- ΔP Pressure Difference (Newton per Square Meter)
- µ Dynamic Viscosity (Poise)
- T_{smax} Maximum Shear Stress in Shaft (Newton per Square Millimeter)
- τ Shear Stress (Pascal)





Constants, Functions, Measurements used

- 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) Length Unit Conversion
- Measurement: Pressure in Newton per Square Meter (N/m²) Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed 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: Specific Weight in Kilonewton per Cubic Meter (kN/m³) Specific Weight Unit Conversion
- Measurement: Pressure Gradient in Newton per Cubic Meter (N/m³)
 Pressure Gradient Unit Conversion
- Measurement: Stress in Pascal (Pa), Newton per Square Millimeter (N/mm²)

Stress Unit Conversion



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- Laminar Flow between Parallel Plates, both plates at rest



- Laminar Flow of Fluid in an Open Channel Formulas
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