1. Velocity:

$$v = \frac{4Q}{\pi d^2} \quad [\text{m/s}]$$

    where:
    $Q -$ *flow rate* $\ [m^3/s]$
    $d -$ *hydraulic diameter* $\ [m]$

2. Reynolds number:

$$R_e = \frac{d * v}{\nu}$$

    where:
    $d -$ *hydraulic diameter* $[m]$
    $v -$ *velocity* $[m/s]$
    $\nu -$ *kinematic viscosity* $[m^2/s]$

3. Friction factor:

$$\lambda = \frac{64}{R_e} \ , \quad \textit{for } R_e \leqslant 2300$$

$$\frac{1}{\sqrt{\lambda}} = -2 \log \left(\frac{k}{3.71 \, d} + \frac{2.51}{R_e \sqrt{\lambda}} \right), \quad \textit{for } R_e \geqslant 4000 \ \ (\text{Colebrook - White})$$

$$\textit{for } 2300 < R_e < 4000 \ \lambda \textit{ is found trough linear interpolation}$$

4. Major pressure loss:

$$\Delta_{major} = \lambda \cdot \frac{l}{d} \cdot \frac{\rho \cdot v^2}{2}$$

    where:
    $\lambda -$ *friction factor* $\ [\text{-}]$
    $l -$ *pipe length* $\ [m]$
    $d -$ *hydraulic diameter* $\ [m]$
    $\rho -$ *density* $\ [kg/m^3]$
    $v -$ *velocity* $\ [m/s]$

5. Minor pressure loss:

$$\Delta p_{minor} = K \ \frac{\rho v^2}{2} \cdot 10^{-5} \quad [\text{bar}]$$

    where:
    $K - k -$ *factor*
    $\rho -$ *density* $\ [kg/m^3]$
    $v -$ *velocity* $\ [m/s]$

6. Hydrostatic pressure:

$$\Delta_{hydrostatic} = \rho \cdot g \cdot z \cdot 10^{-5} \quad [\text{bar}]$$

    where:
    $\rho -$ *density* $\ [kg/m^3]$
    $g -$ *gravitational acceleration* $\ [m/s^2]$
    $z -$ *elevation change* $\ [m]$