

$$\frac{-[1 - \varphi^2 \cdot (1 - (\frac{pU}{p_0})^{\frac{\kappa-1}{\kappa}})]}{p_0^{\frac{\kappa-1}{2 \cdot \kappa}} \cdot \sqrt{\frac{\kappa}{\kappa-1} (1 - (\frac{pU}{p_0})^{\frac{\kappa-1}{\kappa}})}} \cdot dp_0 = K \cdot dt$$