$m := 20\ \mathrm{kg}$ $P_1 := 250\ \mathrm{kPa}$ $T_1 := 50\ \mathrm{°C}$ $A := 0.2\ \mathrm{m}^2$ $k := 130\ \frac{\mathrm{kN}}{\mathrm{m}}$ $\Delta x := 30\ \mathrm{cm}$

Table A-4 @ $T_1 = 50.00\ \mathrm{°C}$ shows $P_{sat} := 12.352\ \mathrm{kPa}$

Table A-6 is inadequate so approximate the state as statured liquid at $T_1 = 50.00\ \mathrm{°C}$

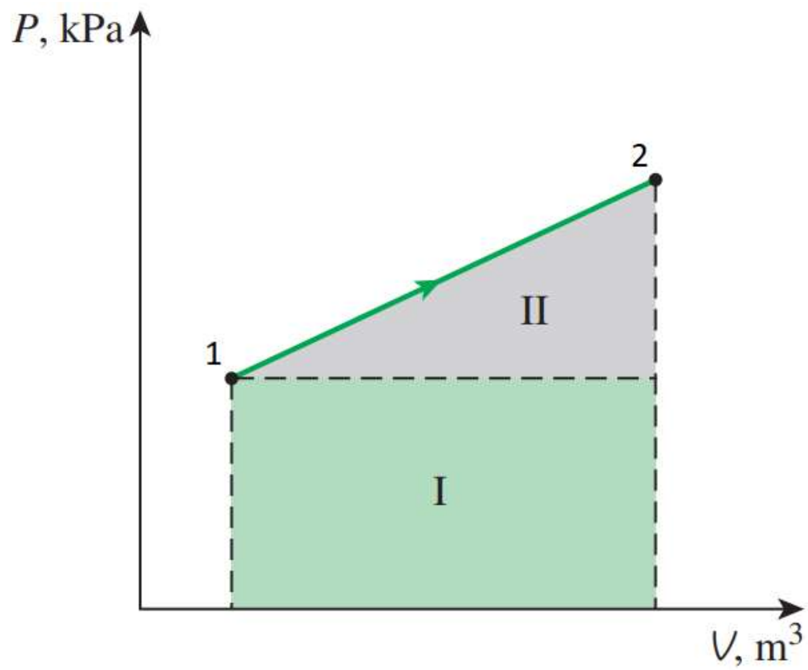
Table A-4 @ $T_1 = 50.00\ \mathrm{°C}$ shows $v_1 := 0.0010012\ \frac{\mathrm{m}^3}{\mathrm{kg}}$

$V_1 := m \cdot v_1 = 0.02002\ \mathrm{m}^3$

$\Delta V := A \cdot \Delta x = 0.06000\ \mathrm{m}^3$

$P_{spring} := \frac{k \cdot \Delta x}{A} = 195.0\ \mathrm{kPa}$

$W_b := P_1 \cdot \Delta V + \frac{1}{2} \cdot P_{spring} \cdot \Delta V = 20.85\ \mathrm{kJ}$



$$W_b = \int_1^2 F \, \mathrm{d}x$$

$$\int_1^2 \left(F_{piston} + F_{spring}\right) \mathrm{d}x$$

$$\int_1^2 F_{piston} \, \mathrm{d}x + \int_1^2 F_{spring} \, \mathrm{d}x$$

$$F_{piston} \cdot \int_1^2 1 \, \mathrm{d}x + \int_1^2 k \cdot x \, \mathrm{d}x$$

$$F_{piston} \cdot \Delta x + k \left(\frac{1}{2} \cdot \Delta x^2\right)$$

$$\frac{A}{A} \cdot \left(F_{piston} \cdot \Delta x + \frac{1}{2} \cdot k \cdot \Delta x^2\right)$$

$$\left(\frac{F_{piston}}{A}\right) \cdot (A \cdot \Delta x) + \frac{1}{2} \cdot \left(\frac{k \cdot \Delta x}{A}\right) \cdot (A \cdot \Delta x)$$

$$P_{piston} \cdot \Delta V + \frac{1}{2} \cdot \frac{F_{spring}}{A} \cdot \Delta V$$

$$P_{piston} \cdot \Delta V + \frac{1}{2} \cdot P_{spring} \cdot \Delta V$$

$$P_1 \cdot \Delta V + \frac{1}{2} \cdot P_{spring} \cdot \Delta V$$