Given: $kJ := 1000J$

A 100 L container contains 4 kg of R-134a at a pressure of 160 kPa.

Required:

Determine the temperature, the quality, and the enthalpy of the refrigerant.

Solution:

The total volume and mass, and the pressure are defined as

$$V_{tot} := 100L = 0.1\cdot m^3 \qquad m_{tot} := 4kg \qquad P_1 := 160kPa$$

The specific volume at the state point is found by

$$\nu_1 := \frac{V_{tot}}{m_{tot}} = 0.025\,\frac{m^3}{kg}$$

Going to Table A-12 @ $P := P_1 = 160\cdot kPa$ shows

$$T_{sat} := (-15.60)\,°C \qquad \nu_f := 0.0007437\,\frac{m^3}{kg} \qquad \nu_g := 0.12348\,\frac{m^3}{kg}$$

$$h_f := 31.21\cdot\frac{kJ}{kg} \qquad h_g := 241.11\,\frac{kJ}{kg}$$

Note: Mathcad does not handle negative relative temperature units as one would expect. A simple fix for this is to encapsulate the negative sign and number within parentheses and then enter in the units as shown above.

Since $\nu_f < \nu_1 < \nu_g$, the state point occurs in the two-phase region. Thus the temperature at the state point is the saturation temperature or

$$\boxed{T_1 := T_{sat} = -15.6\cdot°C}$$

The quality may be found by using the state point specific volume and the ν_f and ν_g values found from the table. This is shown below.

$$\boxed{x_1 := \frac{\nu_1 - \nu_f}{\nu_g - \nu_f} = 0.198}$$

The specific enthalpy at the state point is found by

$$h_1 := h_f + x_1\cdot\left(h_g - h_f\right) = 72.692\cdot\frac{kJ}{kg}$$

The enthalpy at the state point is then

$$\boxed{H_1 := m_{tot}\cdot h_1 = 290.8\cdot kJ}$$