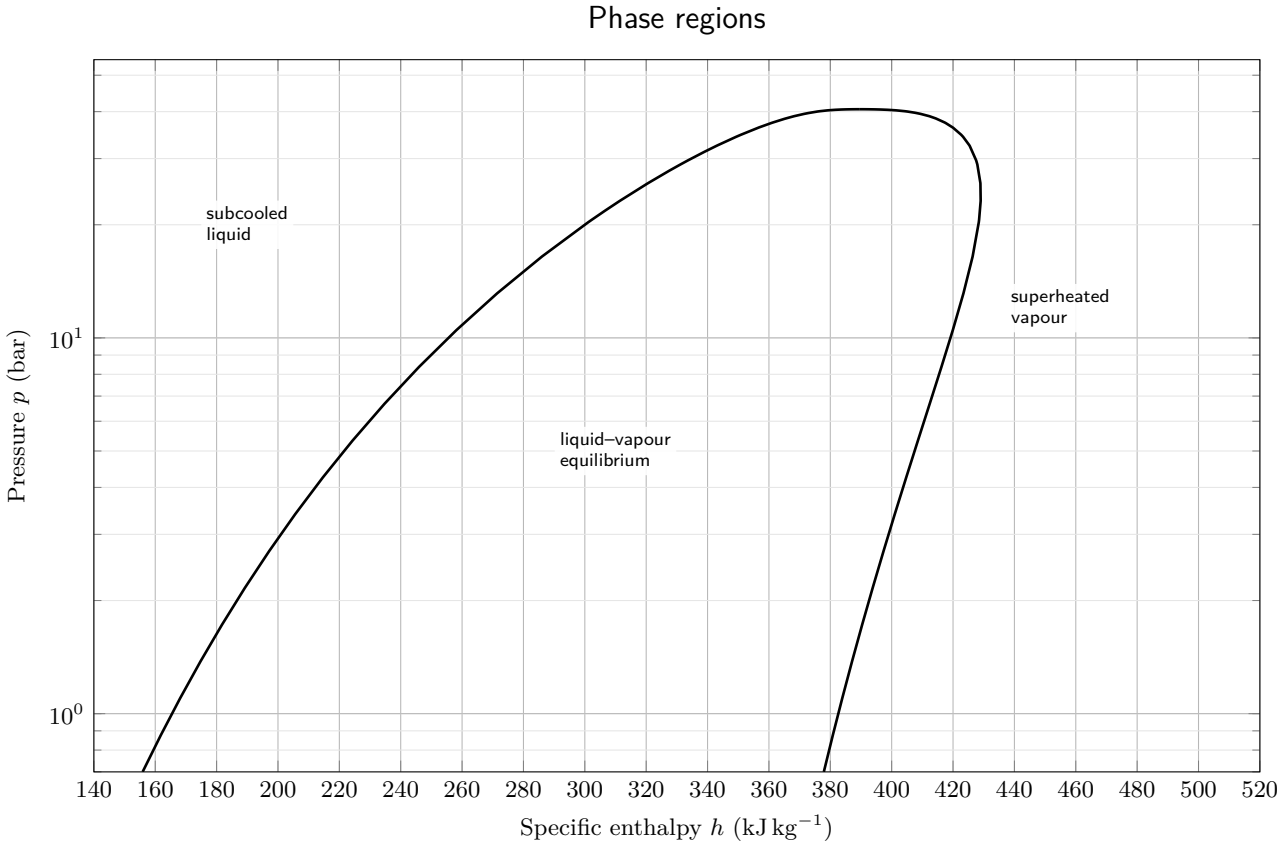
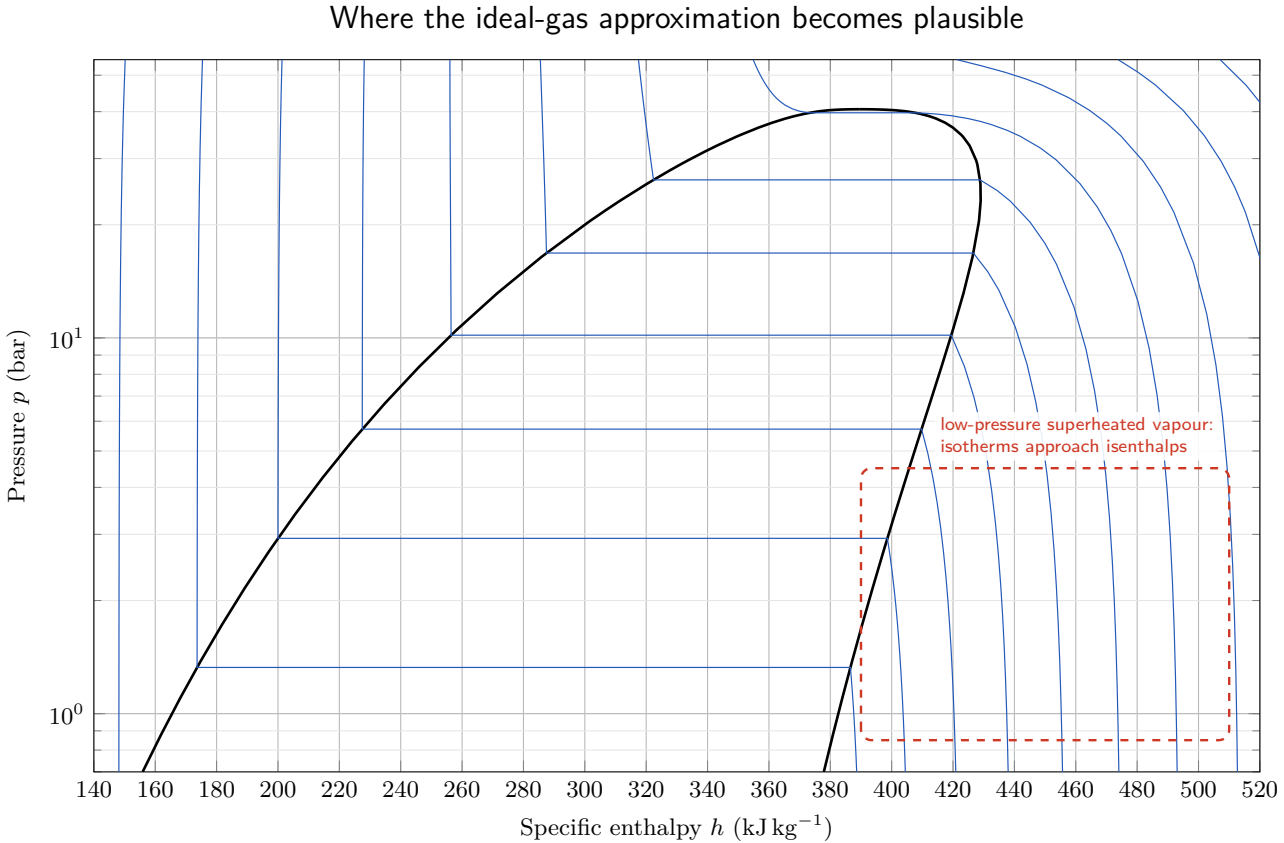
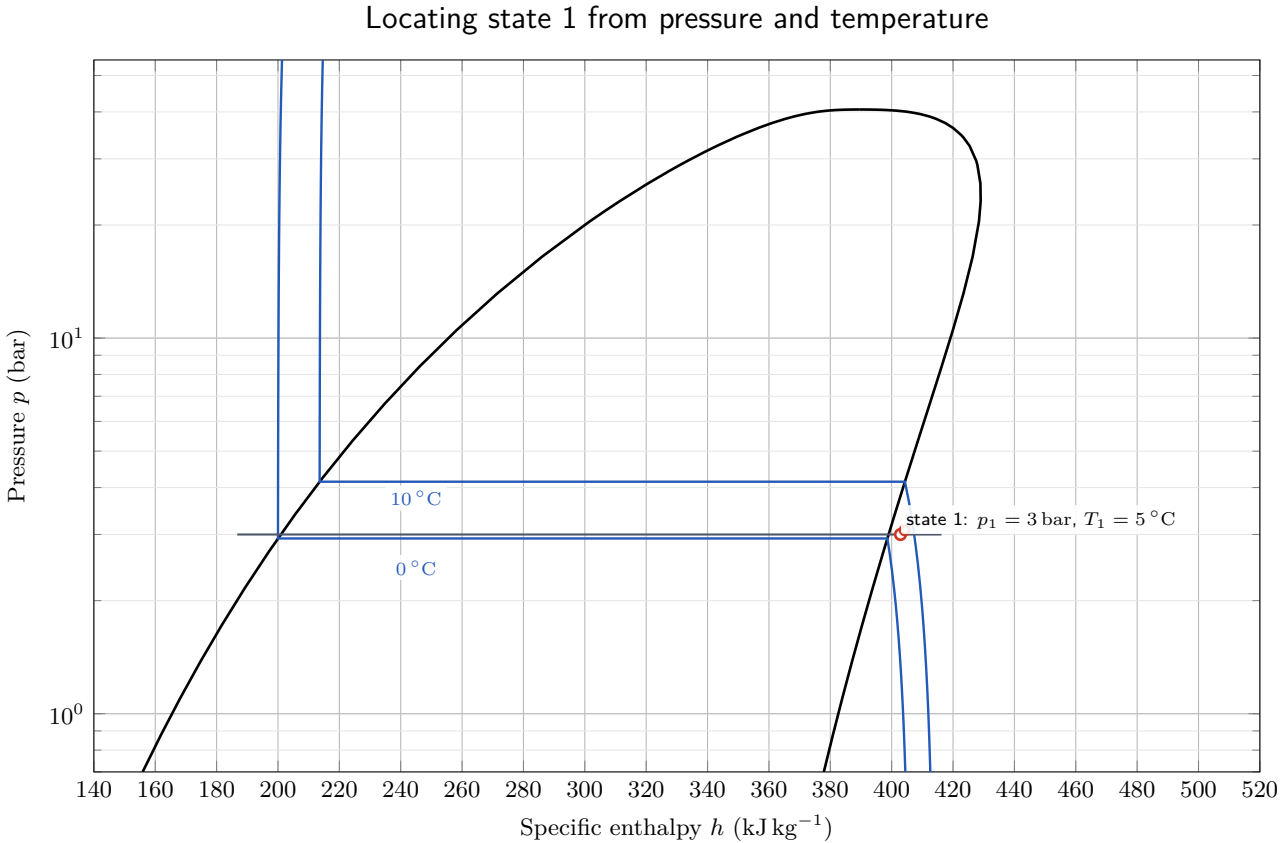
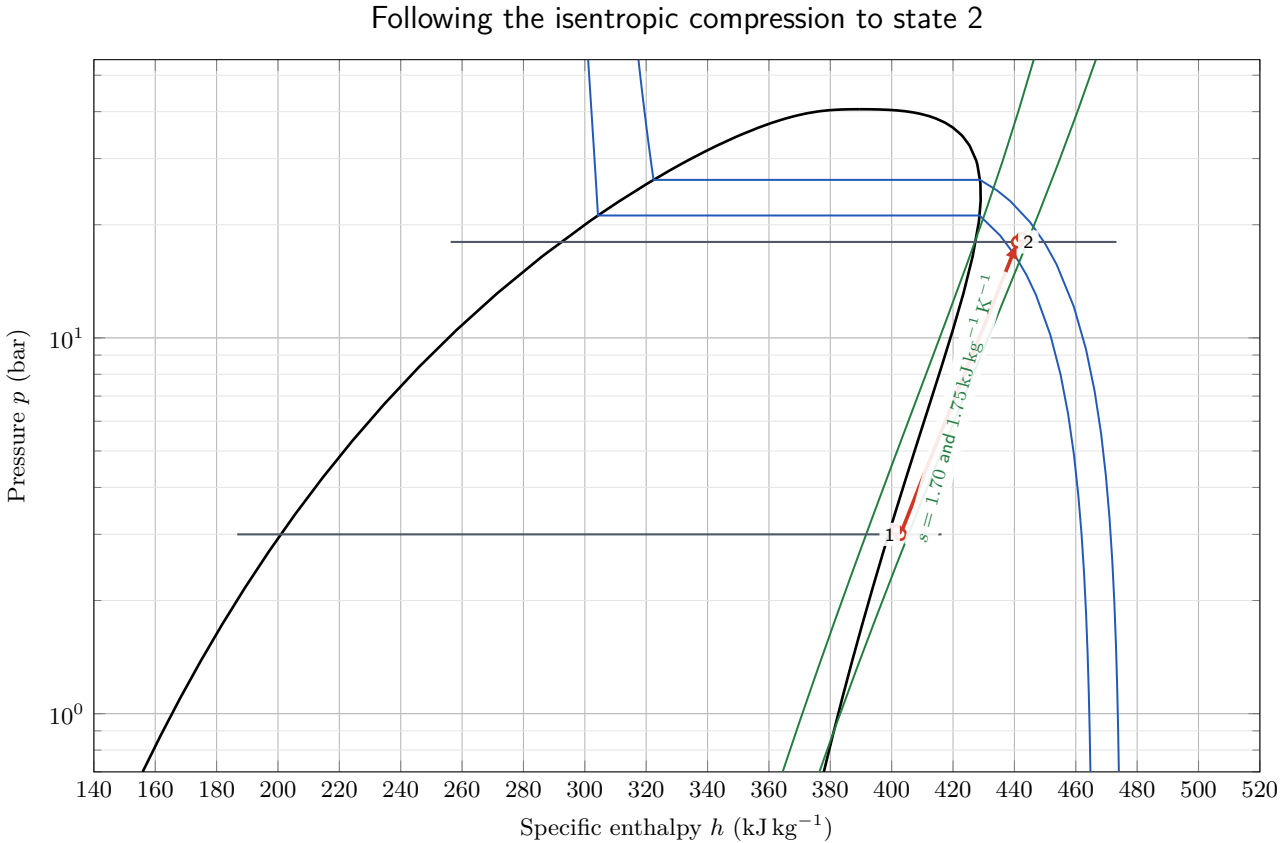
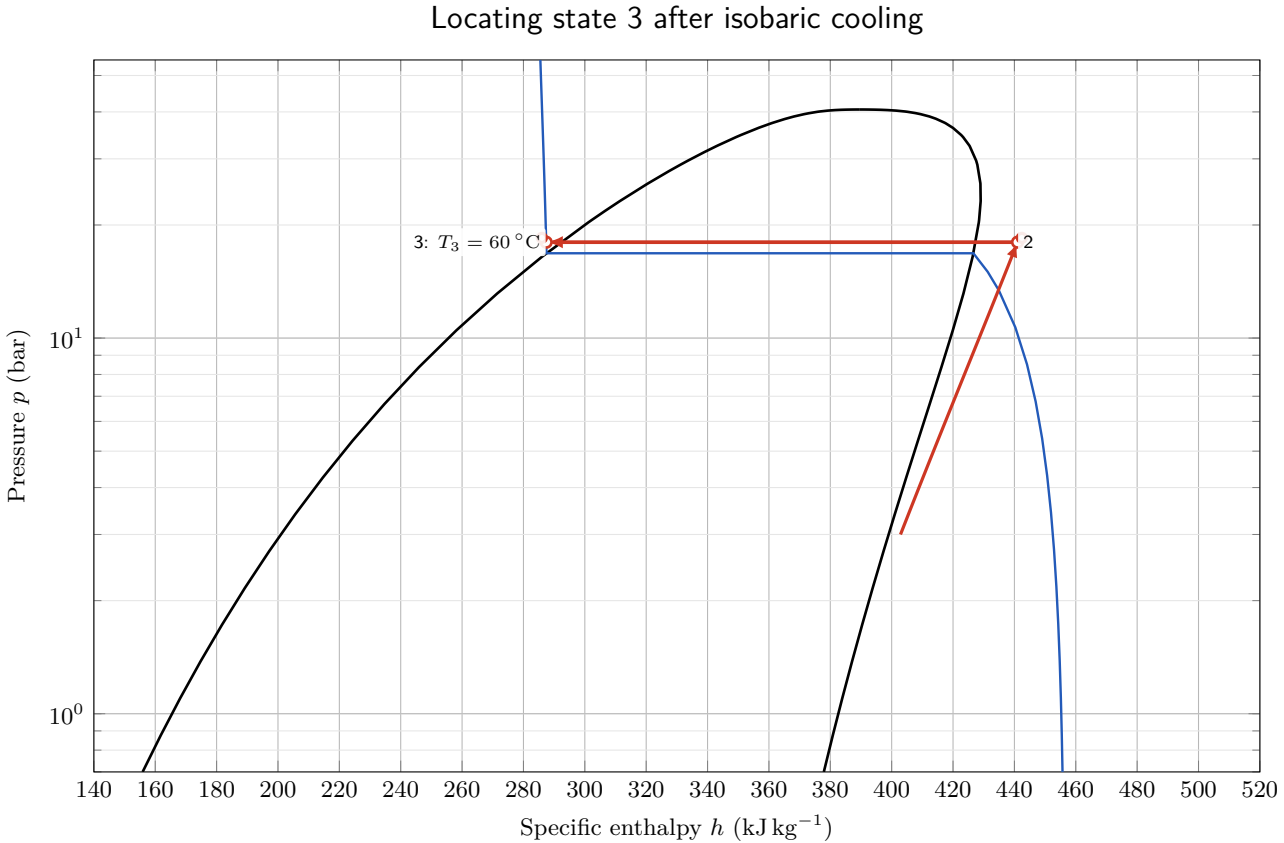
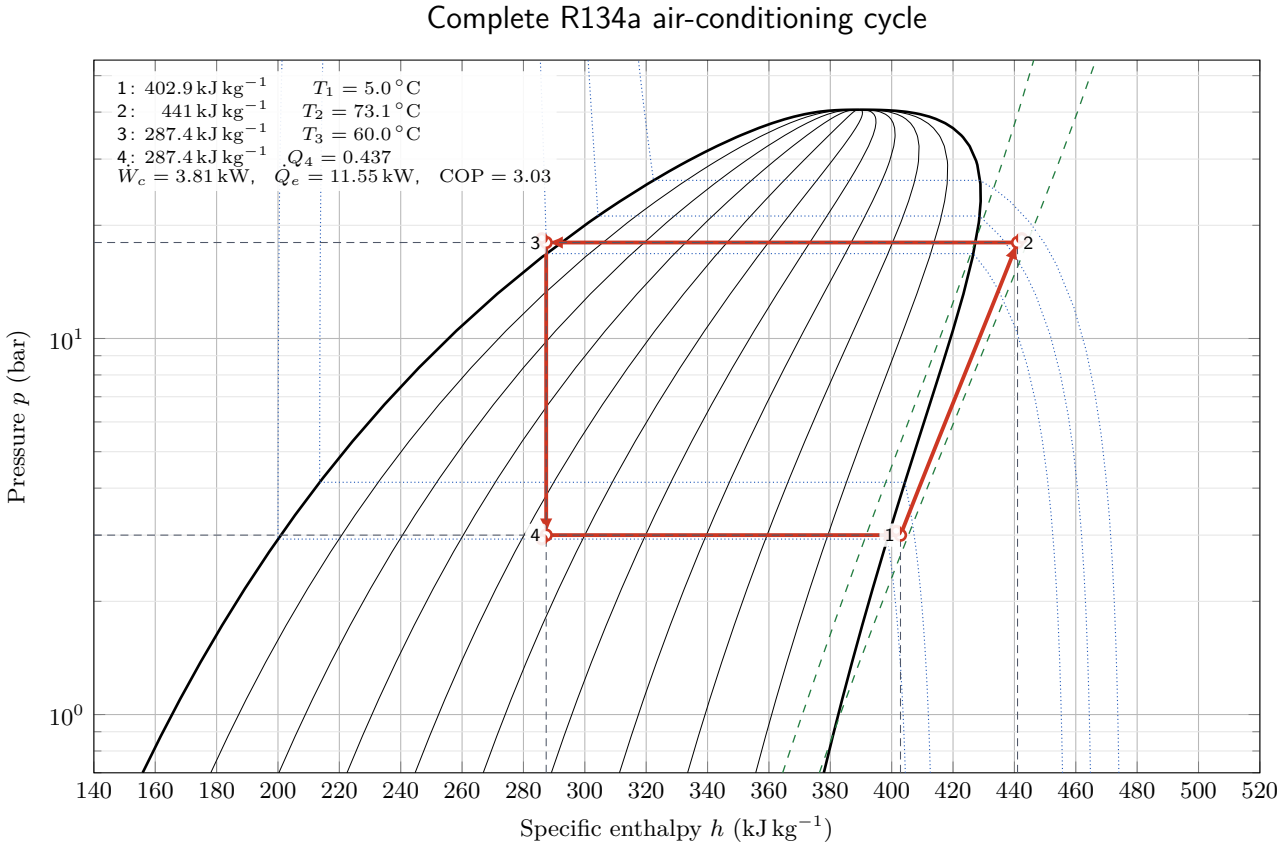

Phase regions
subcooled
liquid
liquid–vapour
equilibrium
superheated
vapour
Pressure p (bar)
10^1
10^0
140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520
Specific enthalpy h (kJ kg^{-1})


Where the ideal-gas approximation becomes plausible
low-pressure superheated vapour:
isotherms approach isenthalps
Pressure p (bar)
10^1
10^0
140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520
Specific enthalpy h (kJ kg^{-1})


Locating state 1 from pressure and temperature
Pressure p (bar)
10^1
10^0
10 °C
0 °C
state 1: $p_1 = 3\,\text{bar}$, $T_1 = 5\,^\circ\text{C}$
140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520
Specific enthalpy h (kJ kg^{-1})


Following the isentropic compression to state 2
Pressure p (bar)
10^1
10^0
140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520
Specific enthalpy h (kJ kg^{-1})
1
2
$s = 1.70$ and $1.75\,\mathrm{kJ\,kg^{-1}K^{-1}}$


Locating state 3 after isobaric cooling
3: $T_3 = 60\,^\circ\mathrm{C}$
2
10^1
10^0
Pressure p (bar)
140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520
Specific enthalpy h (kJ kg^{-1})


Complete R134a air-conditioning cycle
1: 402.9 kJ kg^{-1} $T_1 = 5.0\,^\circ$C
2: 441 kJ kg^{-1} $T_2 = 73.1\,^\circ$C
3: 287.4 kJ kg^{-1} $T_3 = 60.0\,^\circ$C
4: 287.4 kJ kg^{-1} $Q_4 = 0.437$
$\dot{W}_c = 3.81$ kW, $\dot{Q}_e = 11.55$ kW, COP = 3.03
1
2
3
4
10^1
10^0
Pressure p (bar)
140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520
Specific enthalpy h (kJ kg^{-1})