

Chapter 2.3b

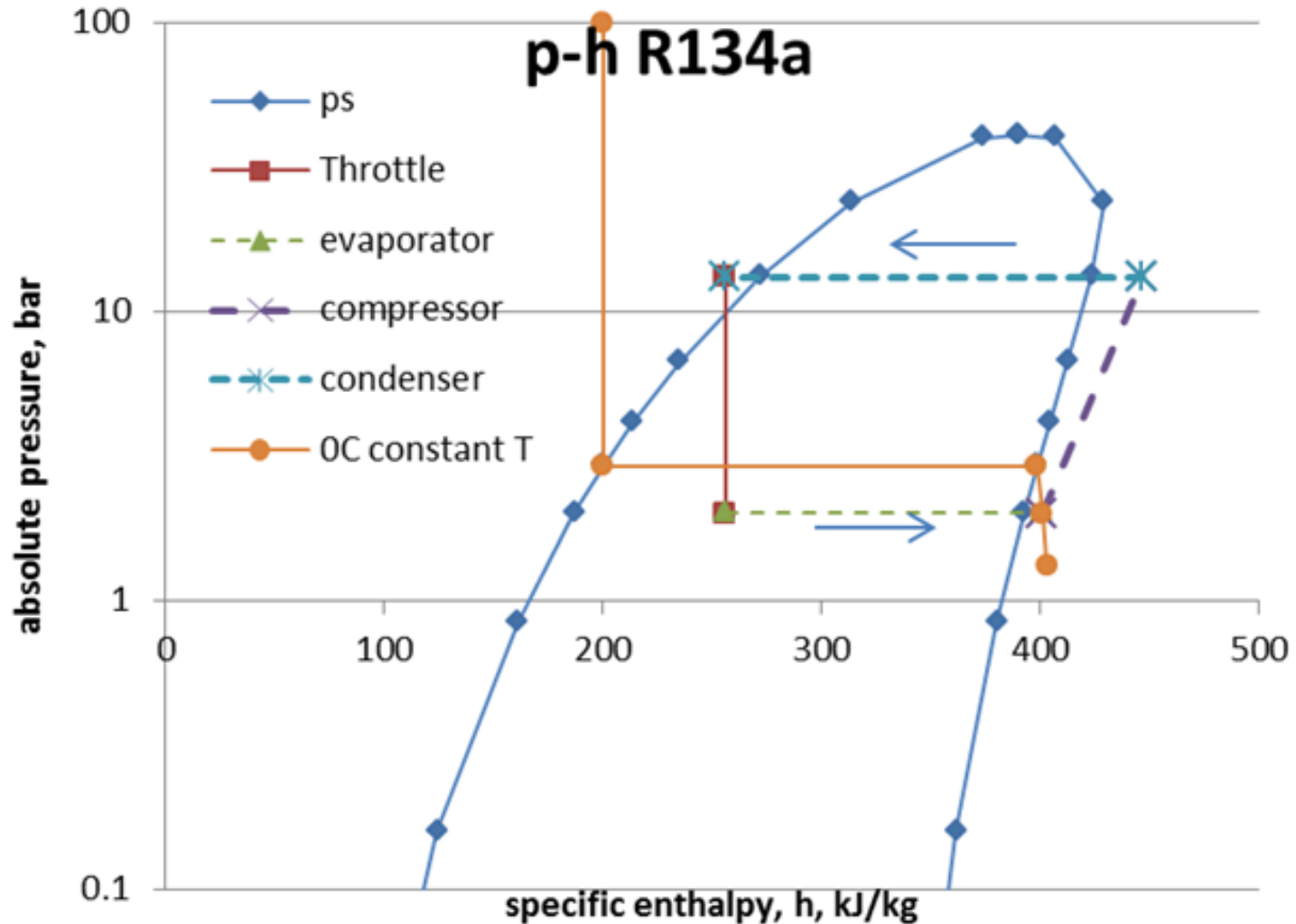
Refrigeration data, chart and
calculations

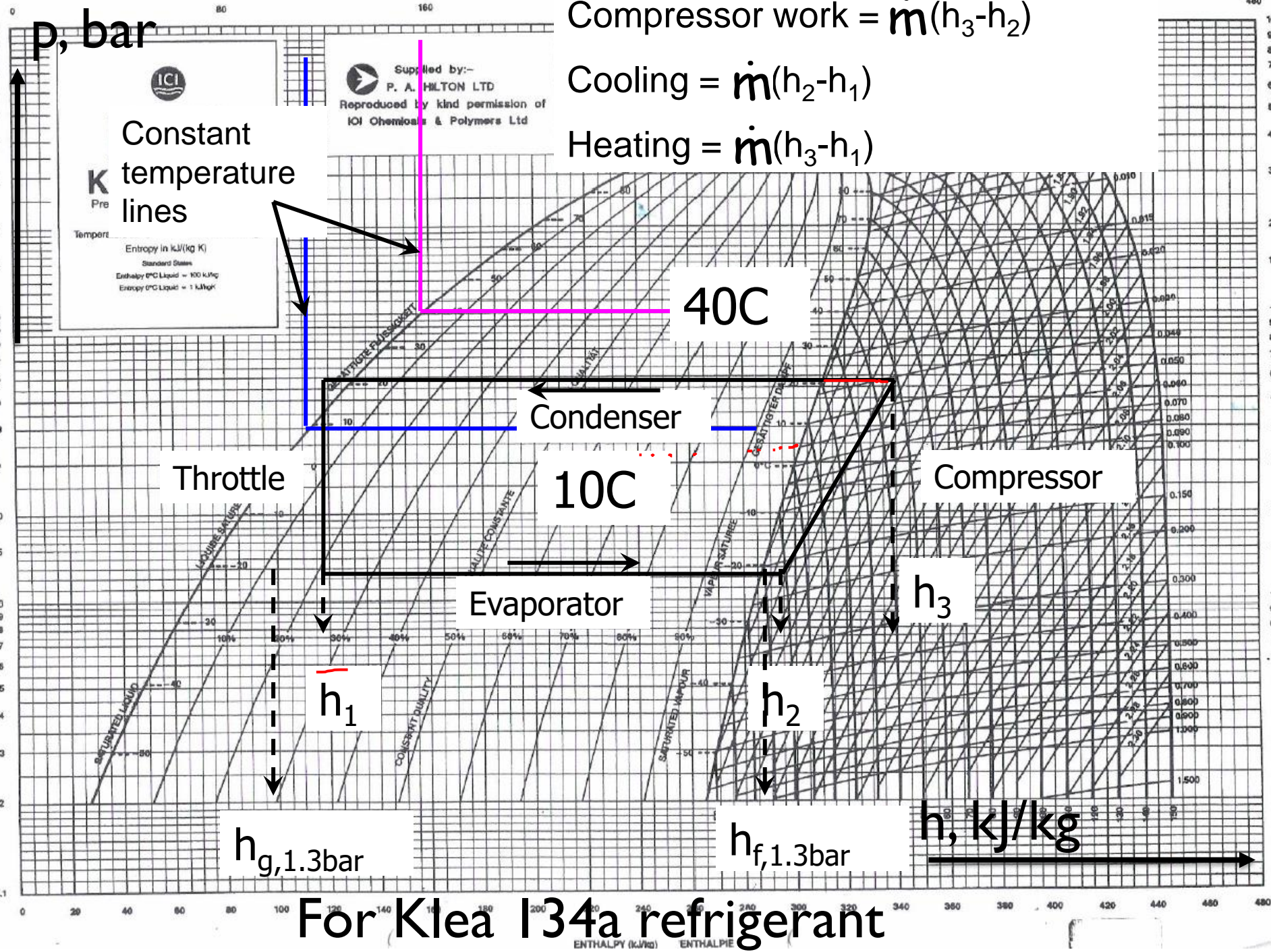
p-h chart – best for heat pumps

- This chart yields changes in enthalpy
- Enthalpy changes show work and heat applied in the different components of the heat pump
- We could use the tables and interpolation, but the chart is quicker

Refrigerant R134a p-h diagram

Notice: constant temperature profile – vertical in liquid region, horizontal in mixture and sharp descent in superheat – only shown for 0°C here.
Refrigeration cycle – clearly enthalpy is obtainable in all the components







Compressor work = $\dot{m}(h_3-h_2)$

Cooling = $\dot{m}(h_2-h_1)$

Heating = $\dot{m}(h_3-h_1)$

For Klea 134a refrigerant

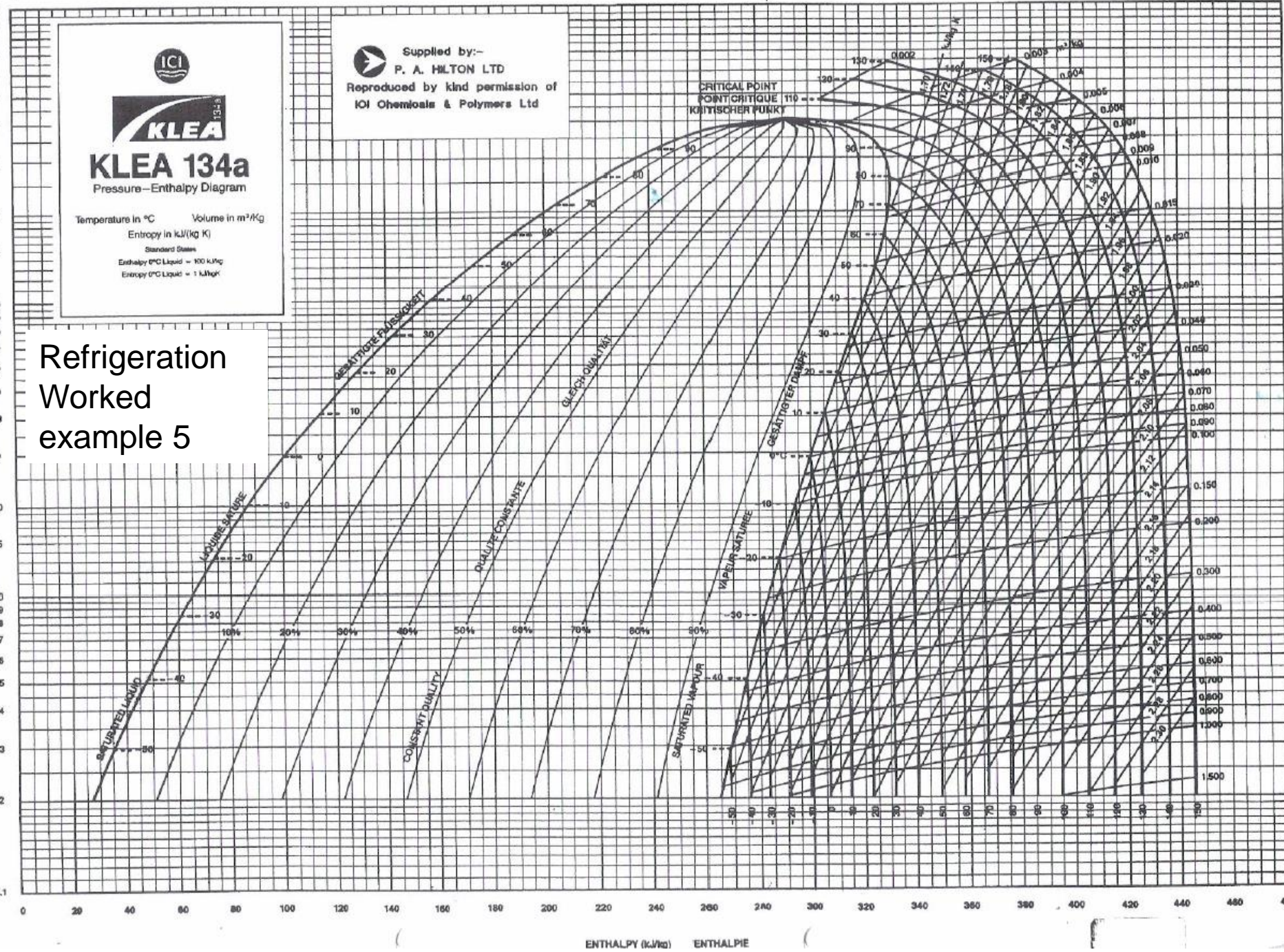
KLEA 134a
Pressure-Enthalpy Diagram

Temperature in °C Volume in m³/Kg
Entropy in kJ/(kg K)

Standard States
Enthalpy °C Liquid = 100 kJ/Kg
Entropy °C Liquid = 1 kJ/KgK

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Refrigeration
Worked
example 5



Coefficient of Performance, CoP

-reminder-

Don't want to use efficiency for how good a heat pump or refrigerator is because it's >1

CoP is the factor by which heat transfer is greater than work.

- Formula:

- $CoP_{heat\ pump} = \frac{\dot{Q}_{condenser}}{\dot{W}_{compressor}}$

- $CoP_{refrigerator} = \frac{\dot{Q}_{evaporator}}{\dot{W}_{compressor}}$