

CO₂ Basic

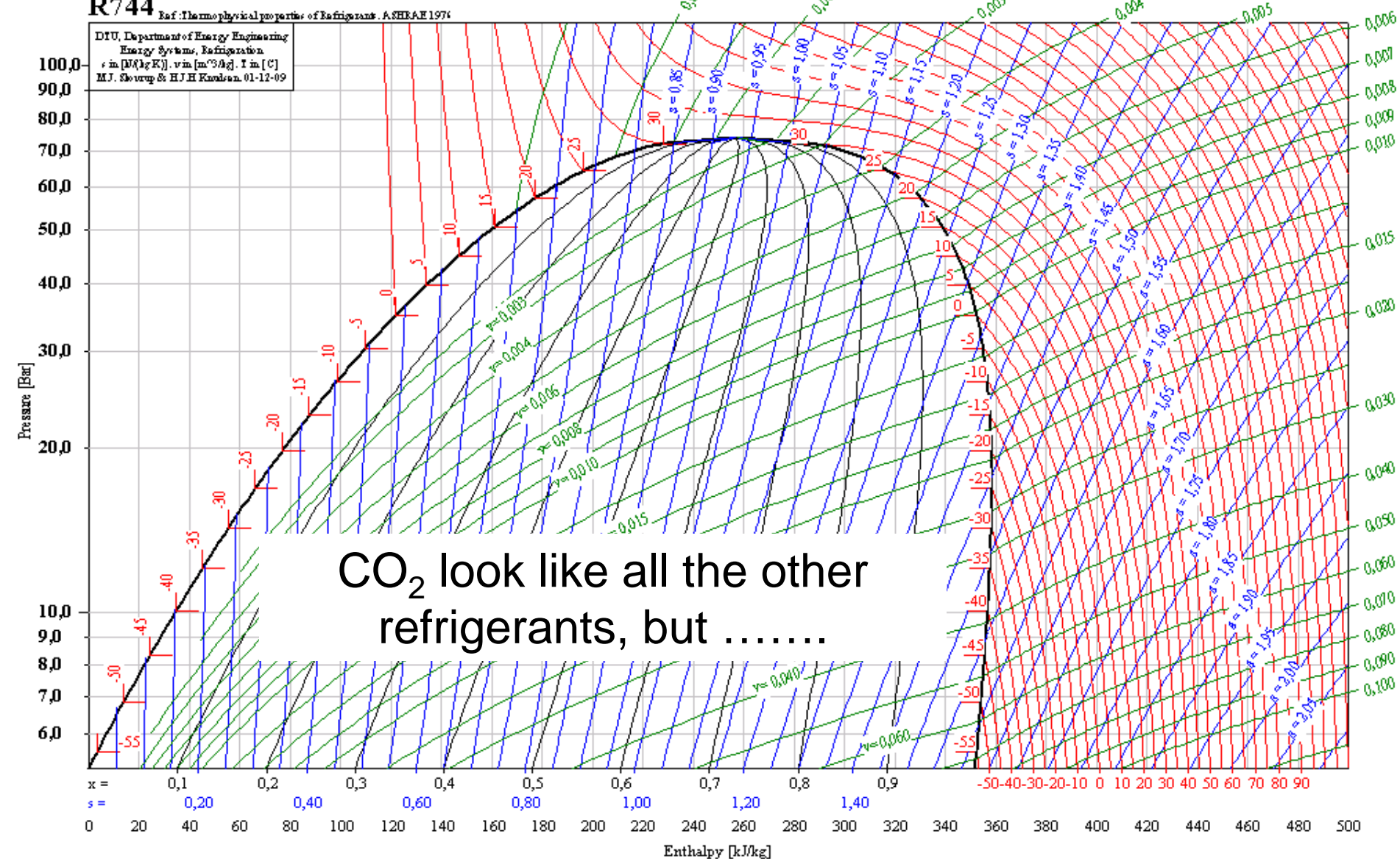
Log p,h-Diagram of CO₂

Refrass

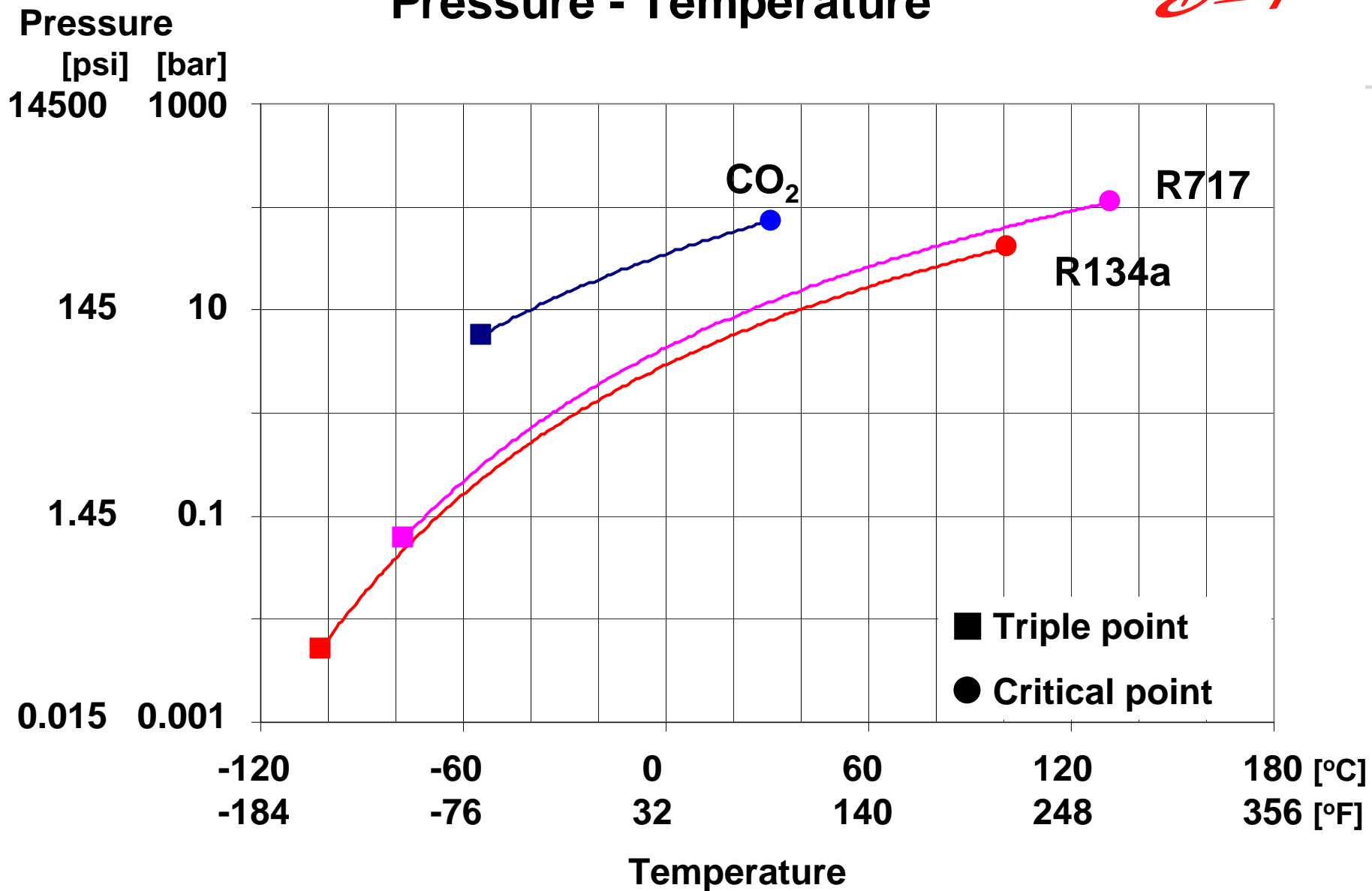
R744

Ref: Thermophysical properties of Refrigerants, ASHRAE 1974

DTU, Department of Energy Engineering
Energy Systems, Refrigeration
s in [M/(kgK)], v in [m³/kg], T in [°C]
M.J. Stoustrup & H.J.H. Knaflitz, 01-12-09



Pressure - Temperature



CO₂ properties compared with various refrigerants

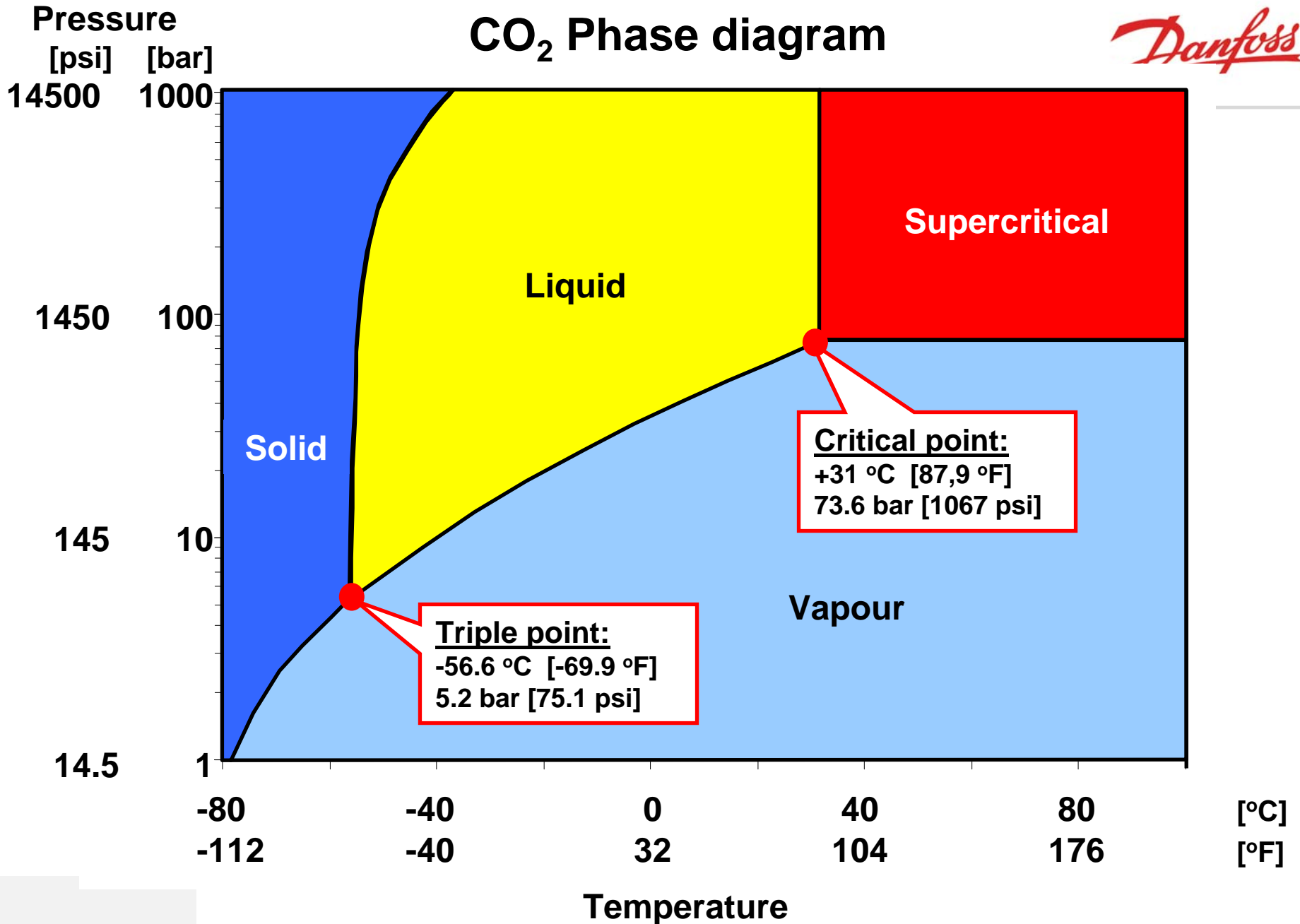


Refrigerant	R134a	R404A	NH ₃	CO ₂
Natural substance	NO	NO	YES	YES
Ozone Depletion Potential (ODP) *	0	0	0	0
Global Warming Potential (GWP) *	1300	3260	-	1
Critical point bar [psi] °C [°F]	40.7 [590] 101.2 [214]	37.3 [541] 72 [162]	113 [1640] 132.4 [270]	73.6 [1067] 31.1 [87.9]
Triple point bar [psi] °C [°F]	0.004 [0.06] -103 [-153]	0.028 [0.41] -100 [-148]	0.06 [0.87] -77.7 [-108]	5.18 [75.1] -56.6 [-69.9]
Flammable or explosive	NO	NO	(YES)	NO
Toxic	NO	NO	YES	NO

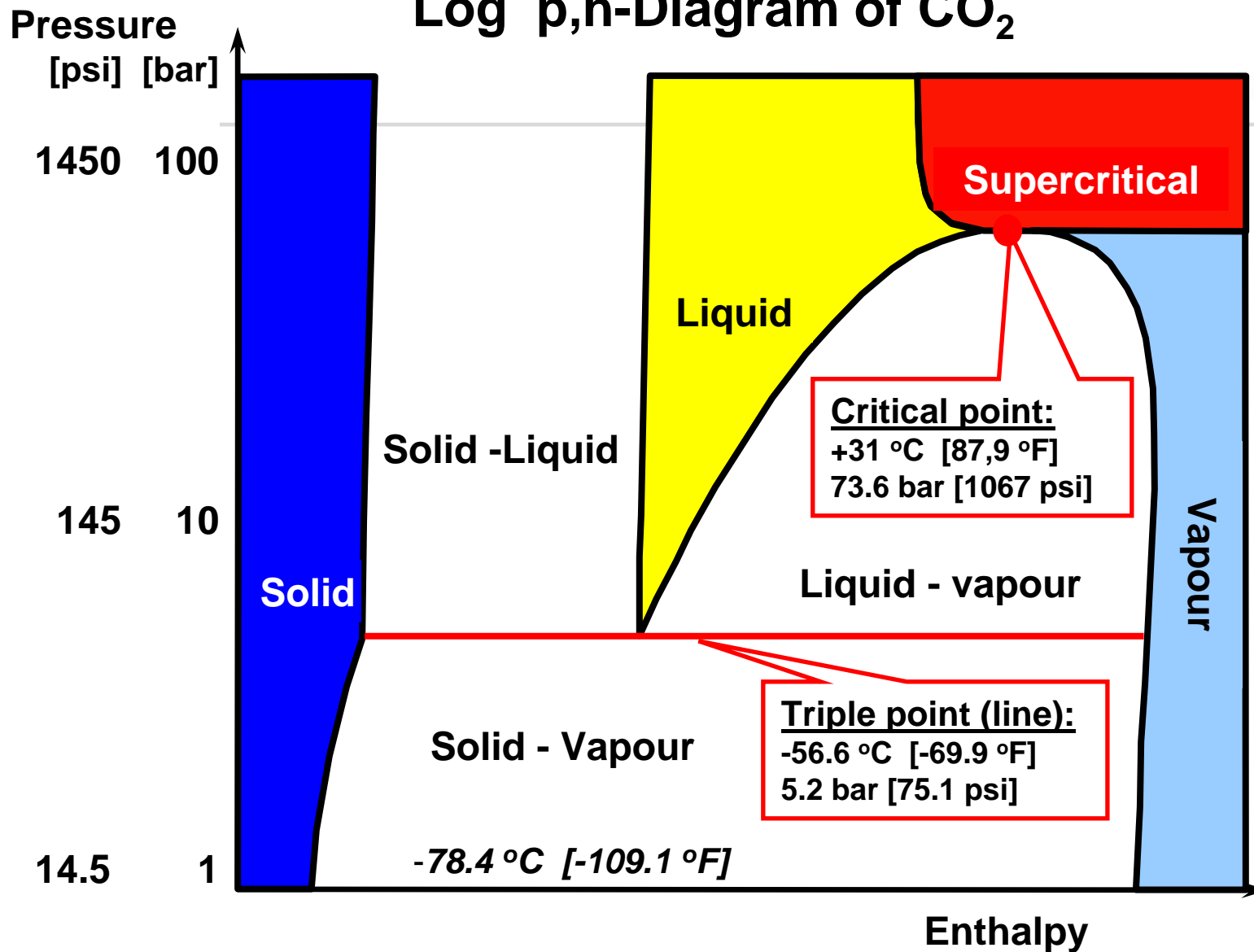
* prEN 378-1 (2006)

CO₂ Phase diagram

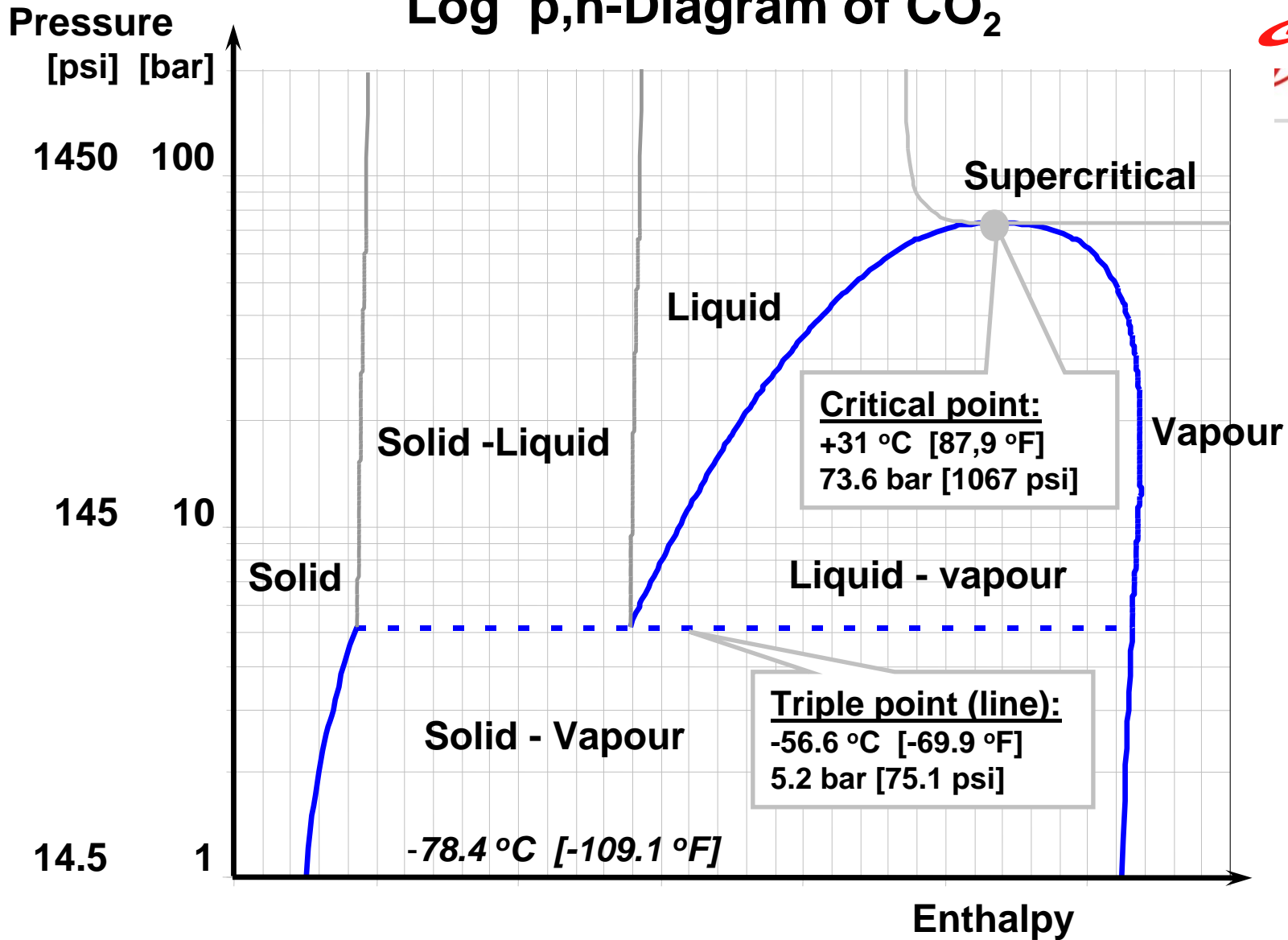
Danfoss



Log p,h-Diagram of CO₂

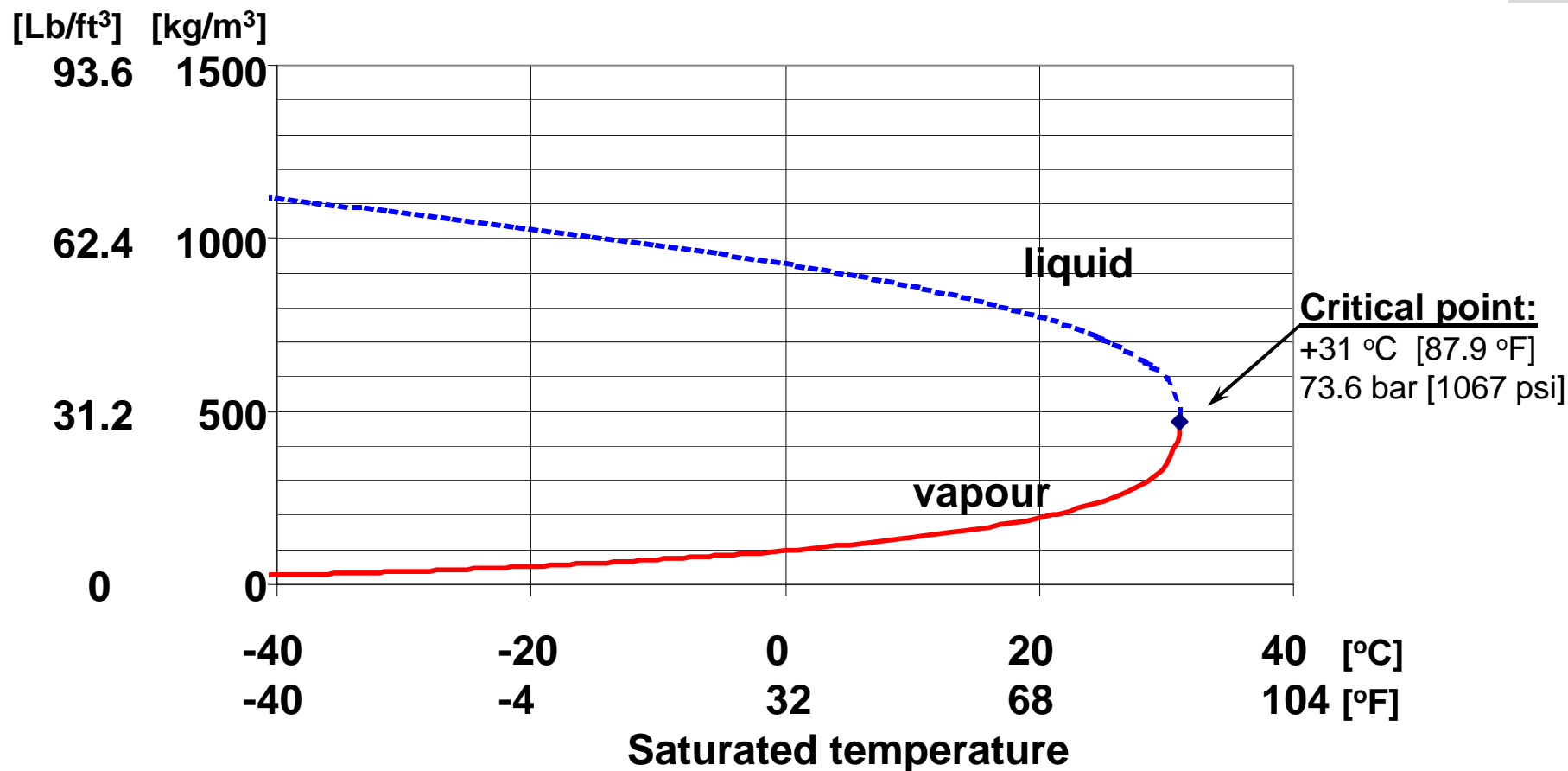


Log p,h-Diagram of CO₂

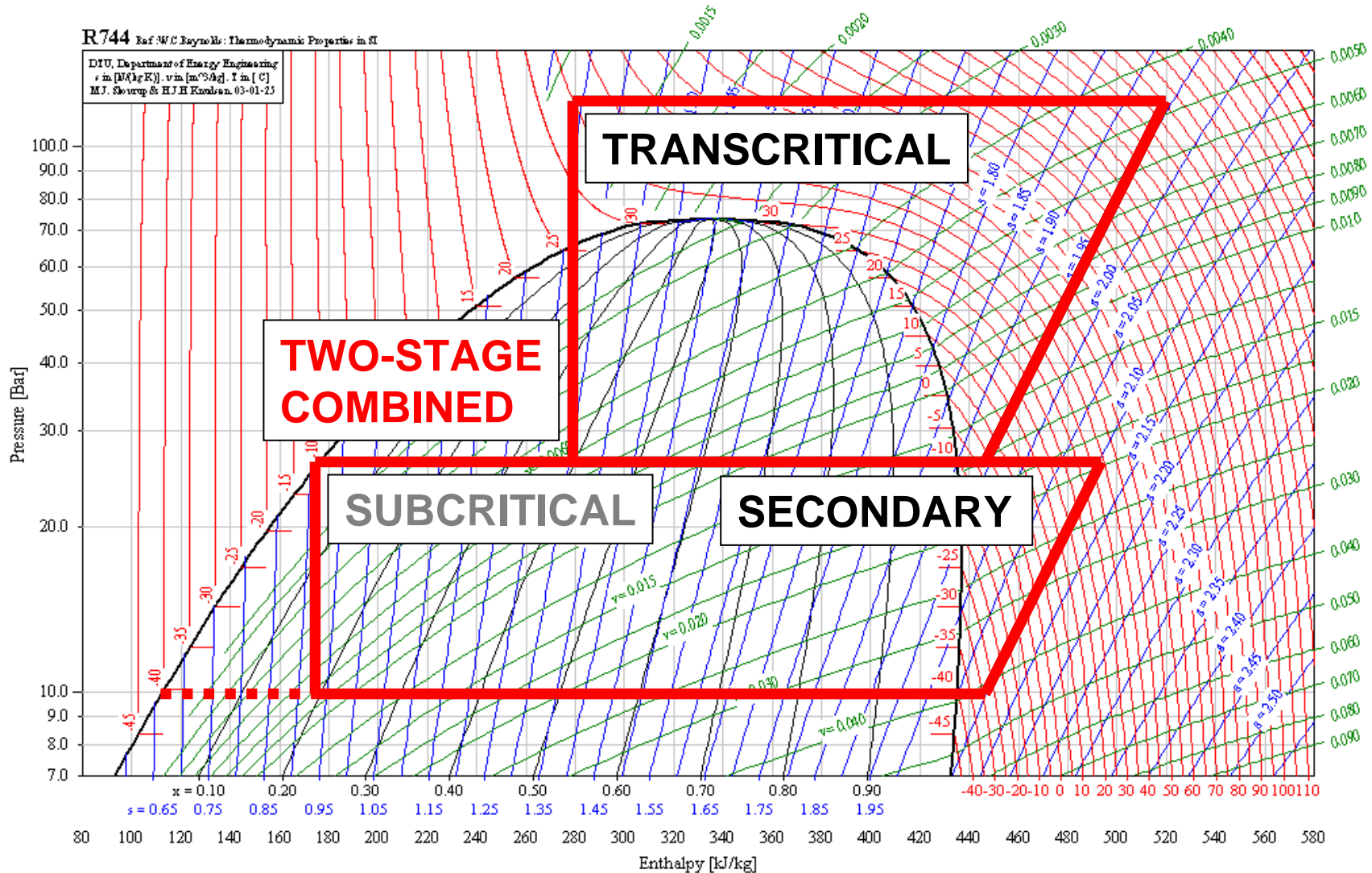


Density

Density - CO₂ liquid / vapour



Refrigeration cycles with CO₂



CO₂ Component Developments

- Design pressure in CO₂ systems

Danfoss

Transcritical CO₂ systems

140 bar: “Practical”
pressure limit

120 bar: Minimum

Subcritical CO₂ systems

90 bar: Optimum pressure for Subcritical
CO₂ systems: *(no control of stand still
pressure needed)*

52 bar: Minimum pressure (temperature) for hot gas defrosting

46 bar

42 bar

40 bar: Minimum “practical” limit

Commercial
Product Line

Industrial
Product Line

