Freon™
Refrigerants

Transport Properties of Freon™ 134a (R-134a) and Freon™ 123 (R-123)

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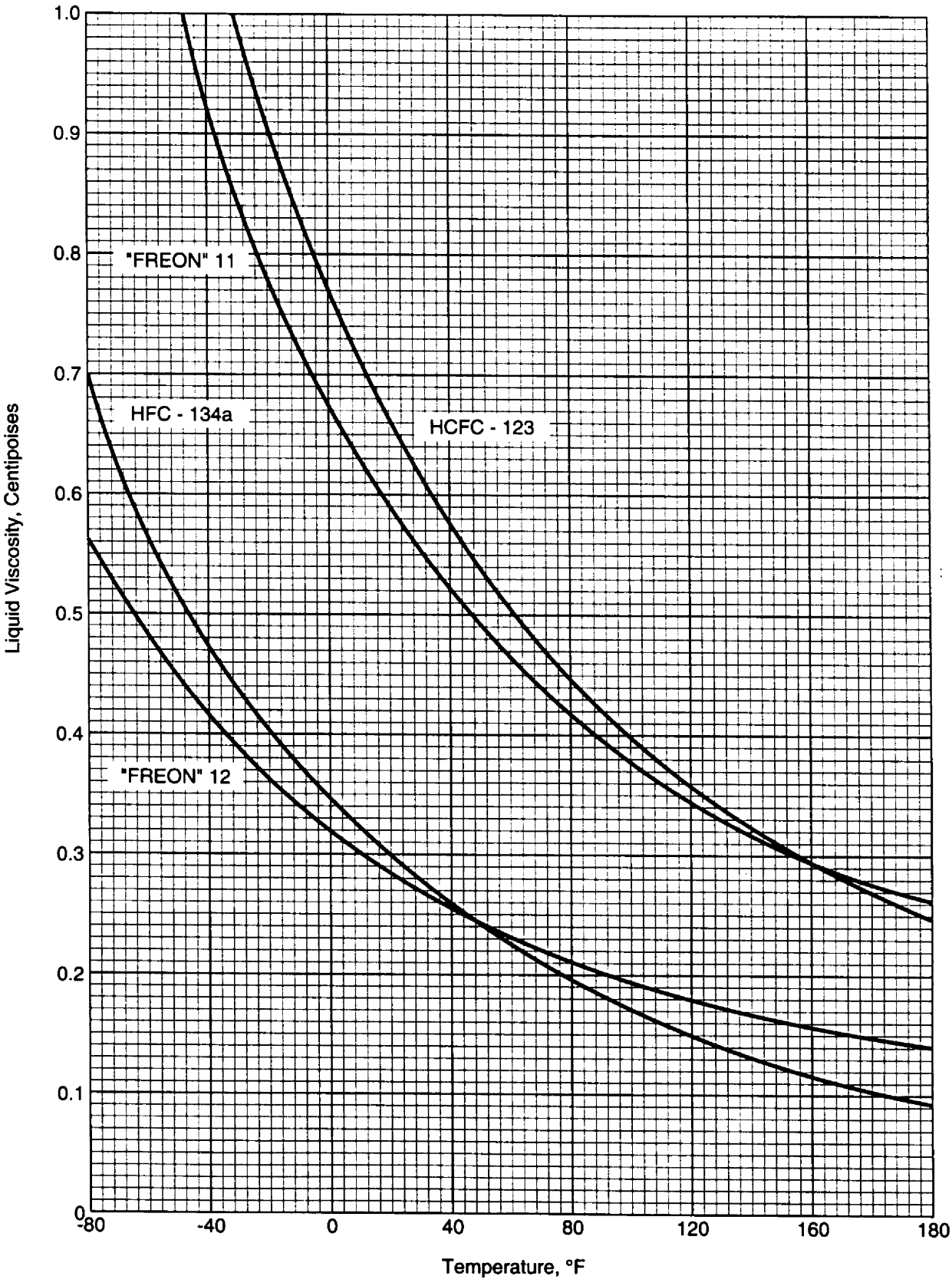
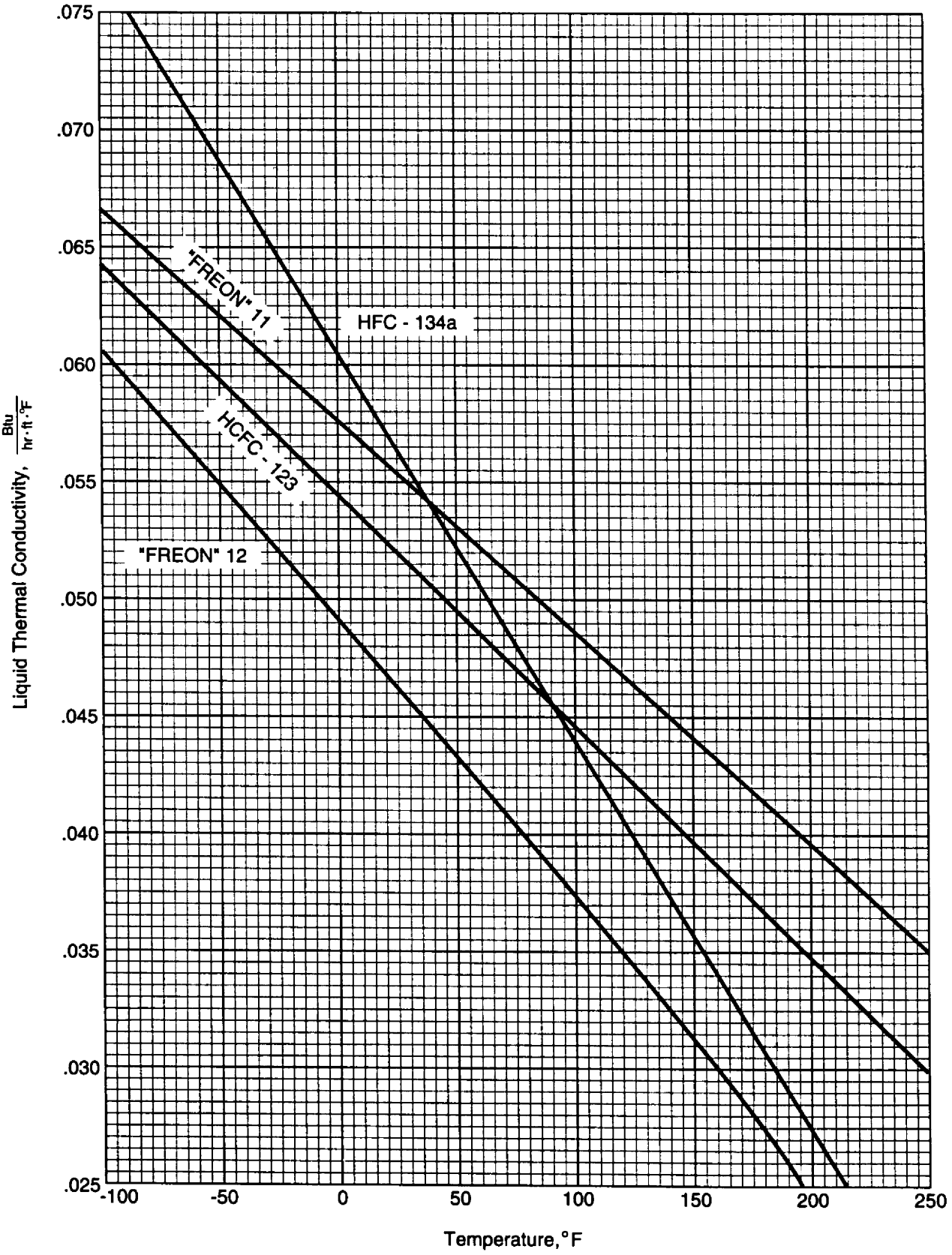
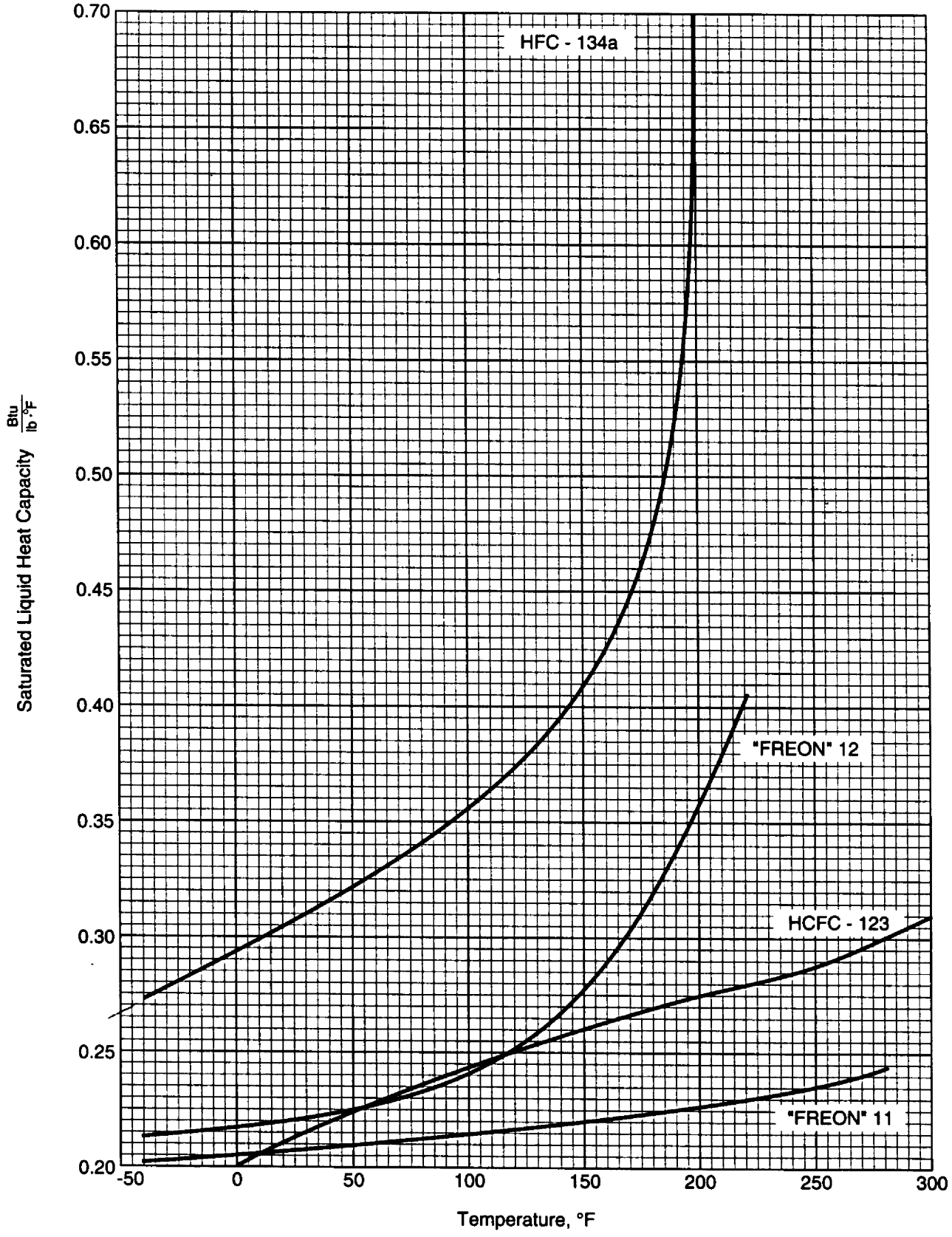


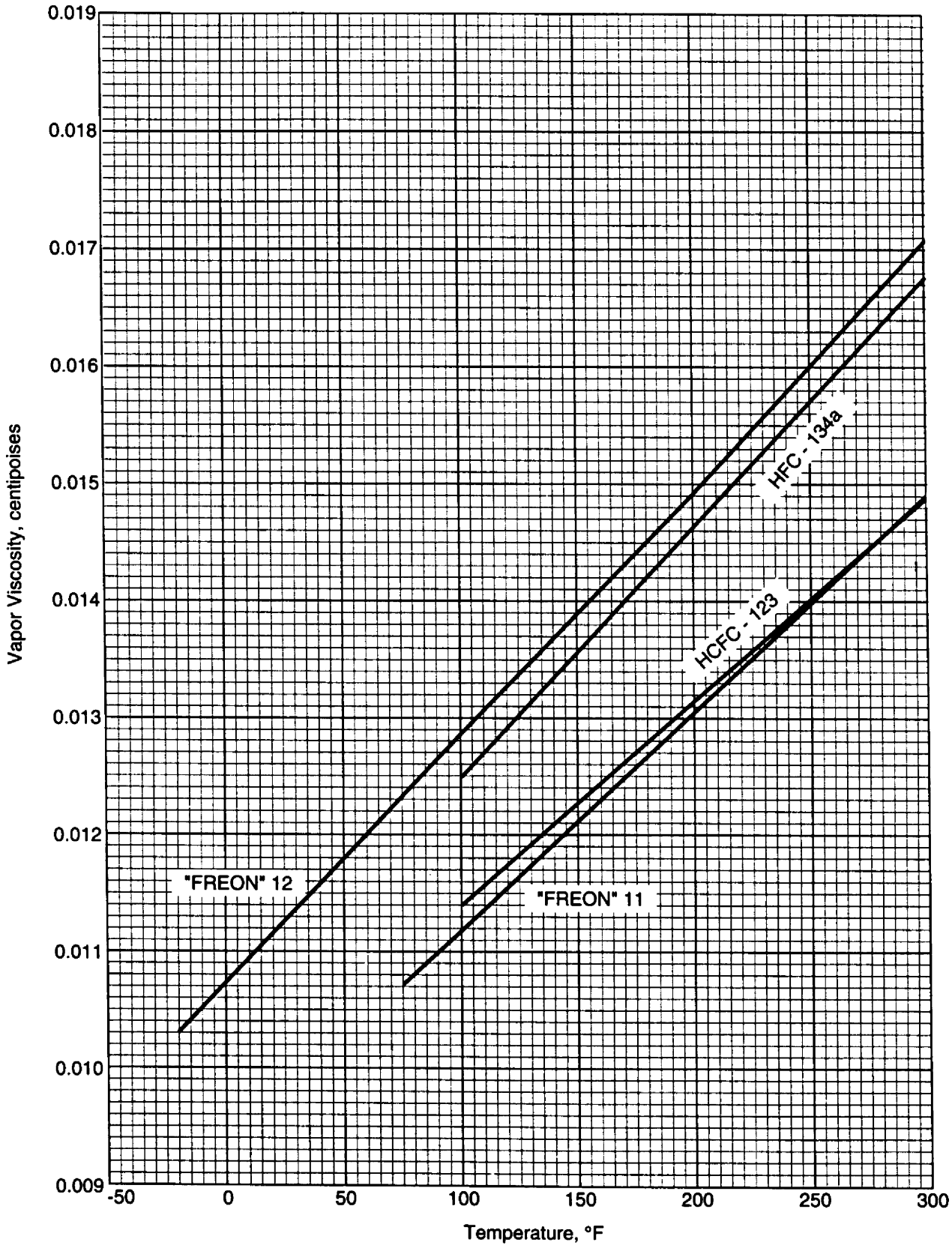
Liquid Thermal Conductivity



Saturated Liquid Heat Capacity



Vapor Viscosity at Atmospheric Pressure



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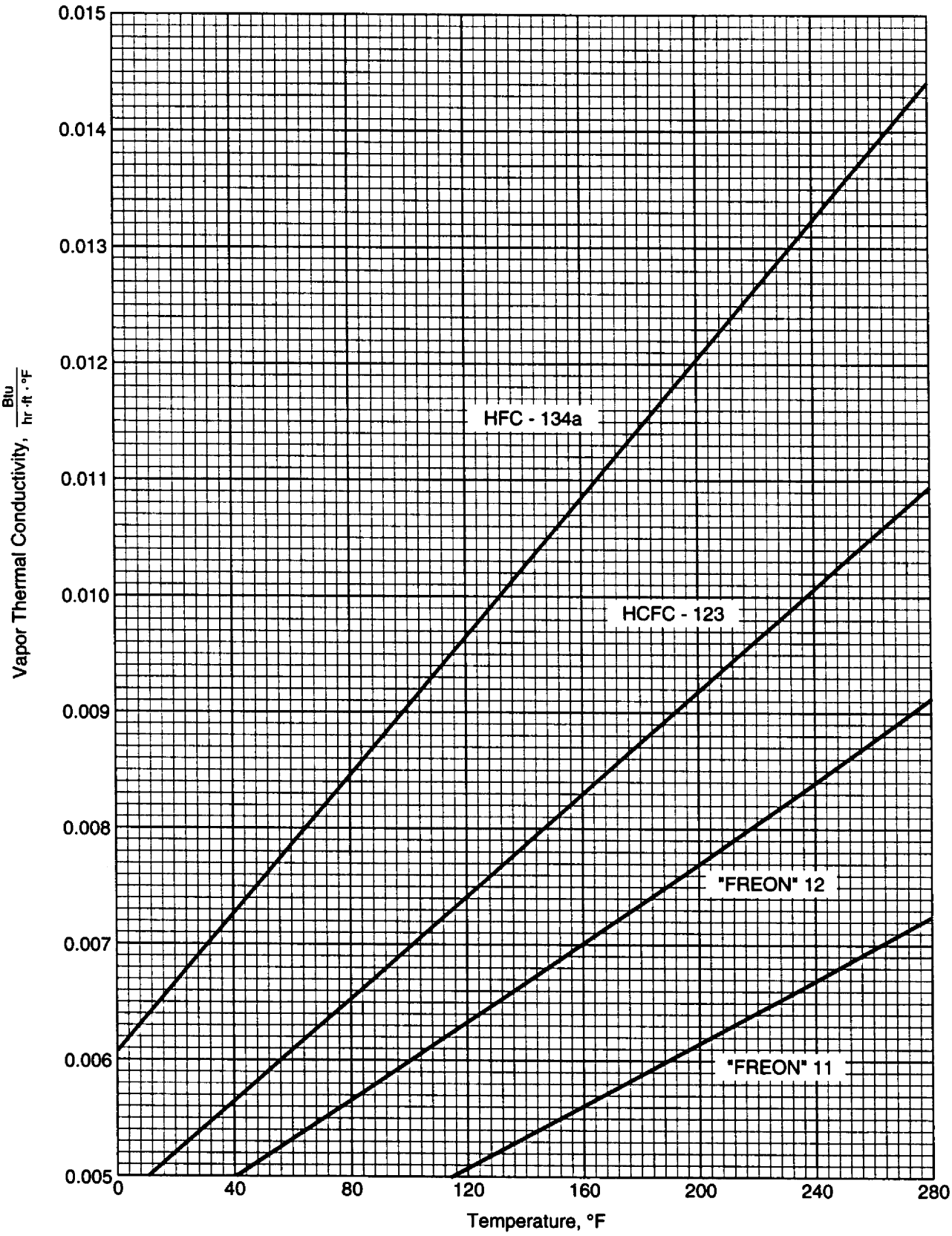
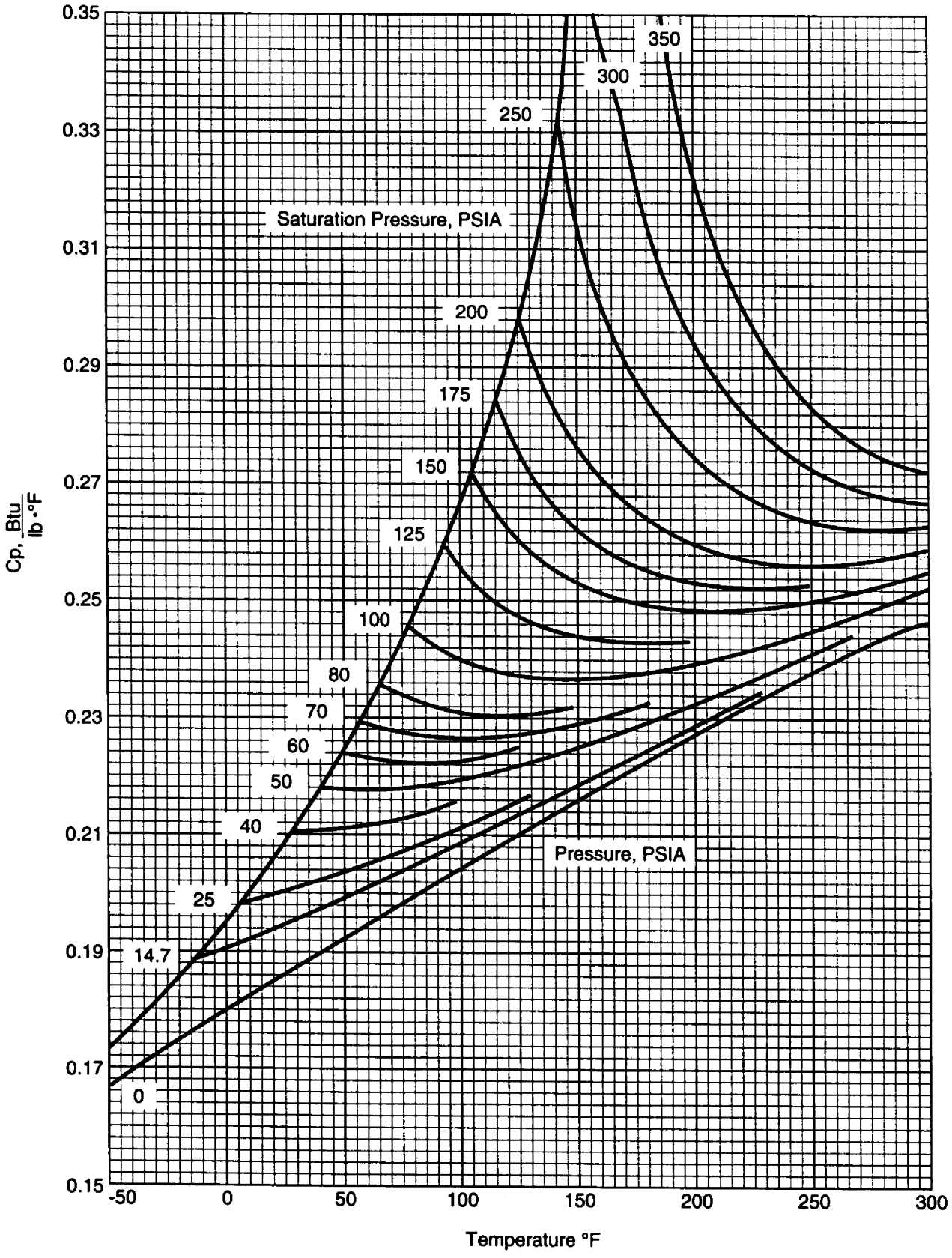
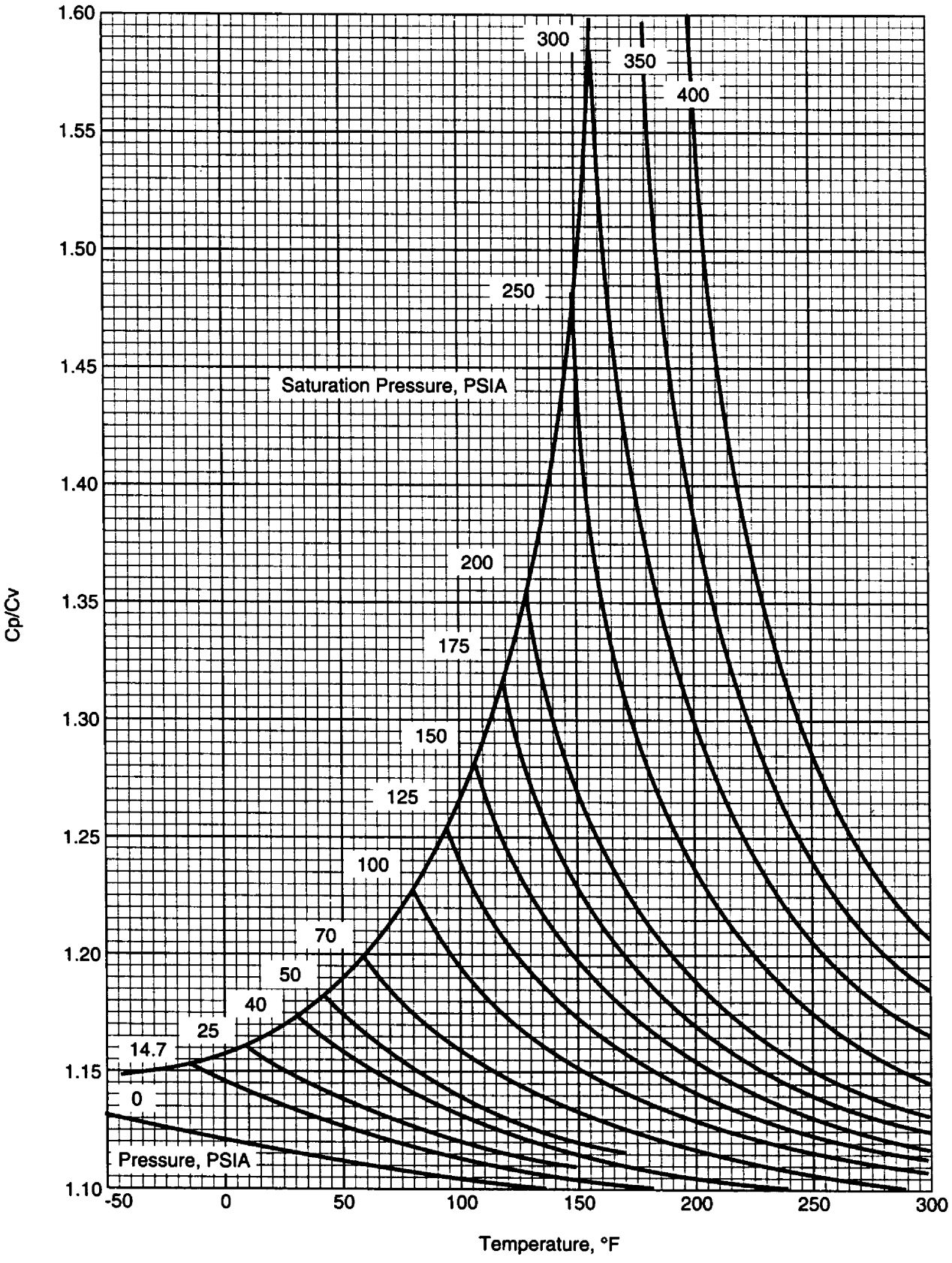


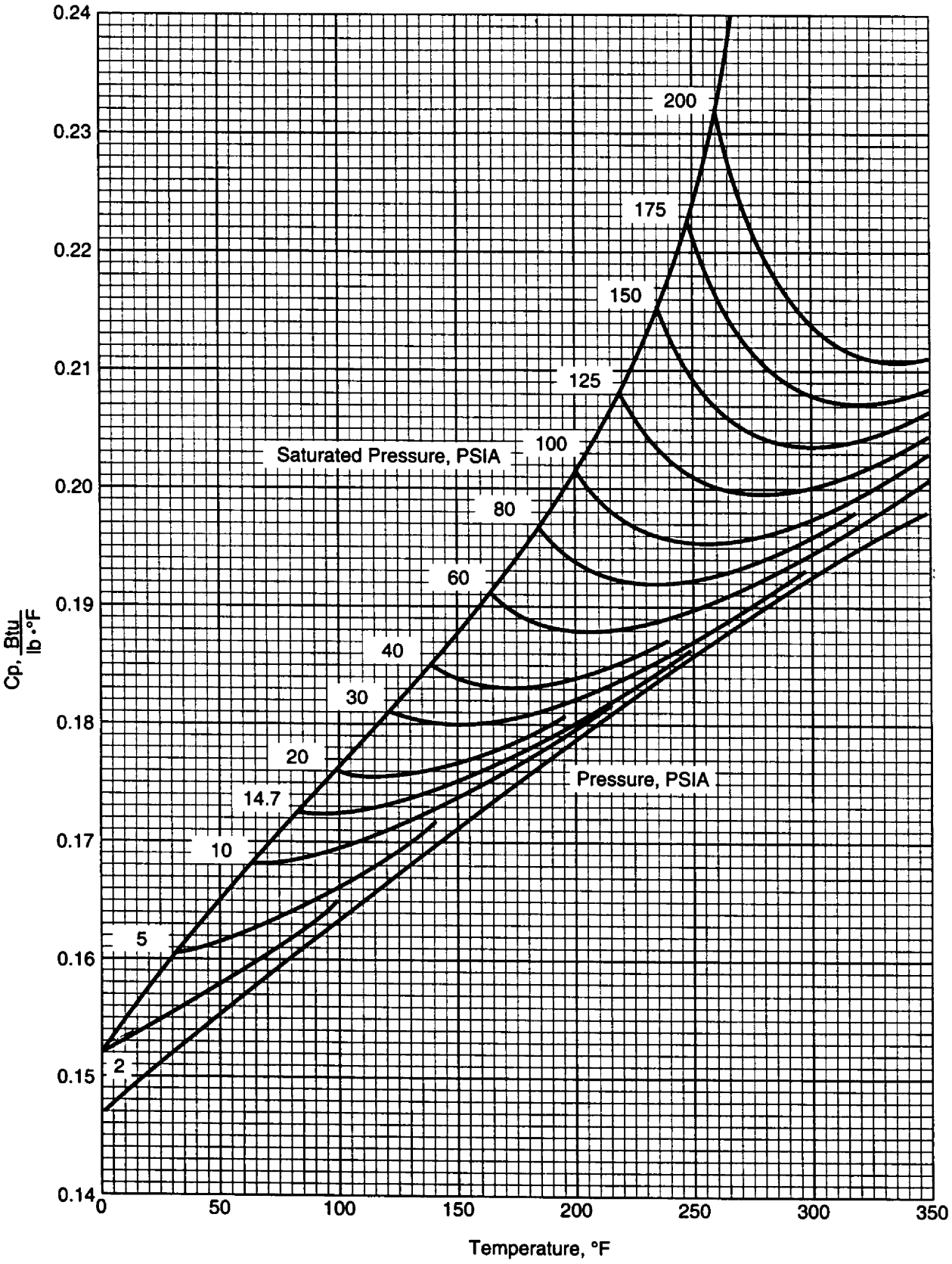
HFC - 134a Vapor Heat Capacity



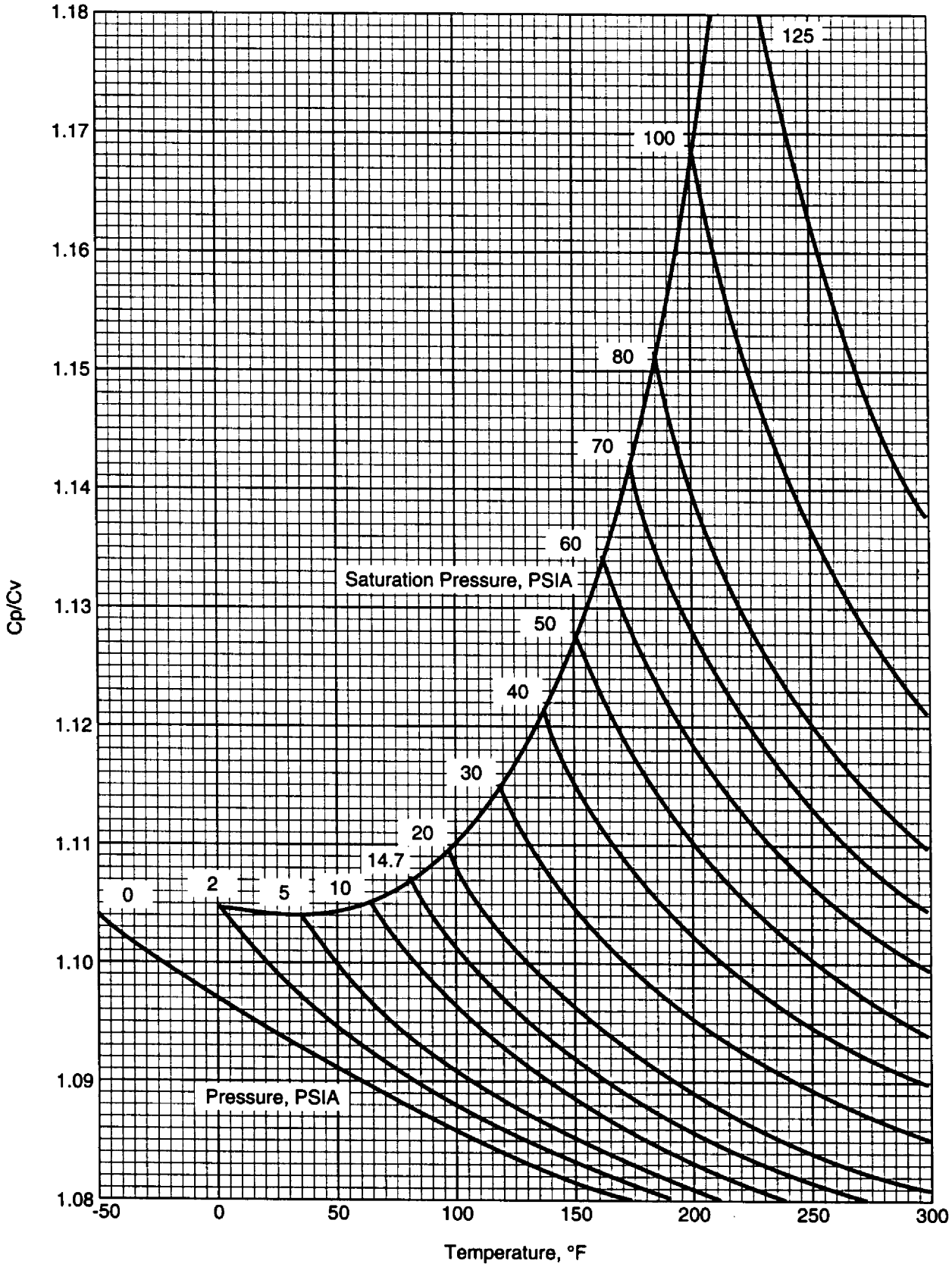
HFC - 134a Vapor Heat Capacity Ratio



HCFC - 123 Vapor Heat Capacity



HCFC - 123 Vapor Heat Capacity Ratio



Equations for Property Estimation

English Units

The measured data has been curve-fitted to obtain the following equations for estimation of properties within the ranges specified.

Liquid Viscosity in cP

HCFC-123: $\mu_l = -0.000000133T^3 + 0.00005259T^2 - 0.007978T + 0.79566$

HFC-134a: $\mu_l = -0.0000000376T^3 + 0.00001575T^2 - 0.00292T + 0.346317$

$(-70 \le T \le 200°F)$

Liquid Thermal Conductivity in Btu/hr ft °F

HCFC-123: $k_l = 0.0548 - 0.000104\ T$ $(-76 \le T \le 248°F)$

HFC-134a: $k_l = 0.06041 - 0.000166\ T$ $(-76 \le T \le 140°F)$

Liquid Heat Capacity in Btu/lbm °F

HCFC-123: $c_p = 0.2016 + 0.0004125\ T$ (for $T < 160°F$)

$$c_p = \exp\left[-580.035 + 119.419 \ln T + \frac{8262.6}{T} - 0.5637\ T + 0.000437\ T^2\right]$$

(for $160 \le T \le 350°F$)

HFC-134a: $c_p = 0.2935 + 0.000729\ T$ (for $T < 170$)

$$c_p = \exp\left[9776.1 - 1887.24 \ln T - \frac{168763}{T} + 5.40\ T - 0.000334\ T^2\right]$$

(for $170°F \le T \le 210°F$)

Vapor Viscosity in cP

HCFC-123: $\mu_v = 0.00956 + 0.0000179T$

HFC-134a: $\mu_v = 0.010338 + 0.0000214T$

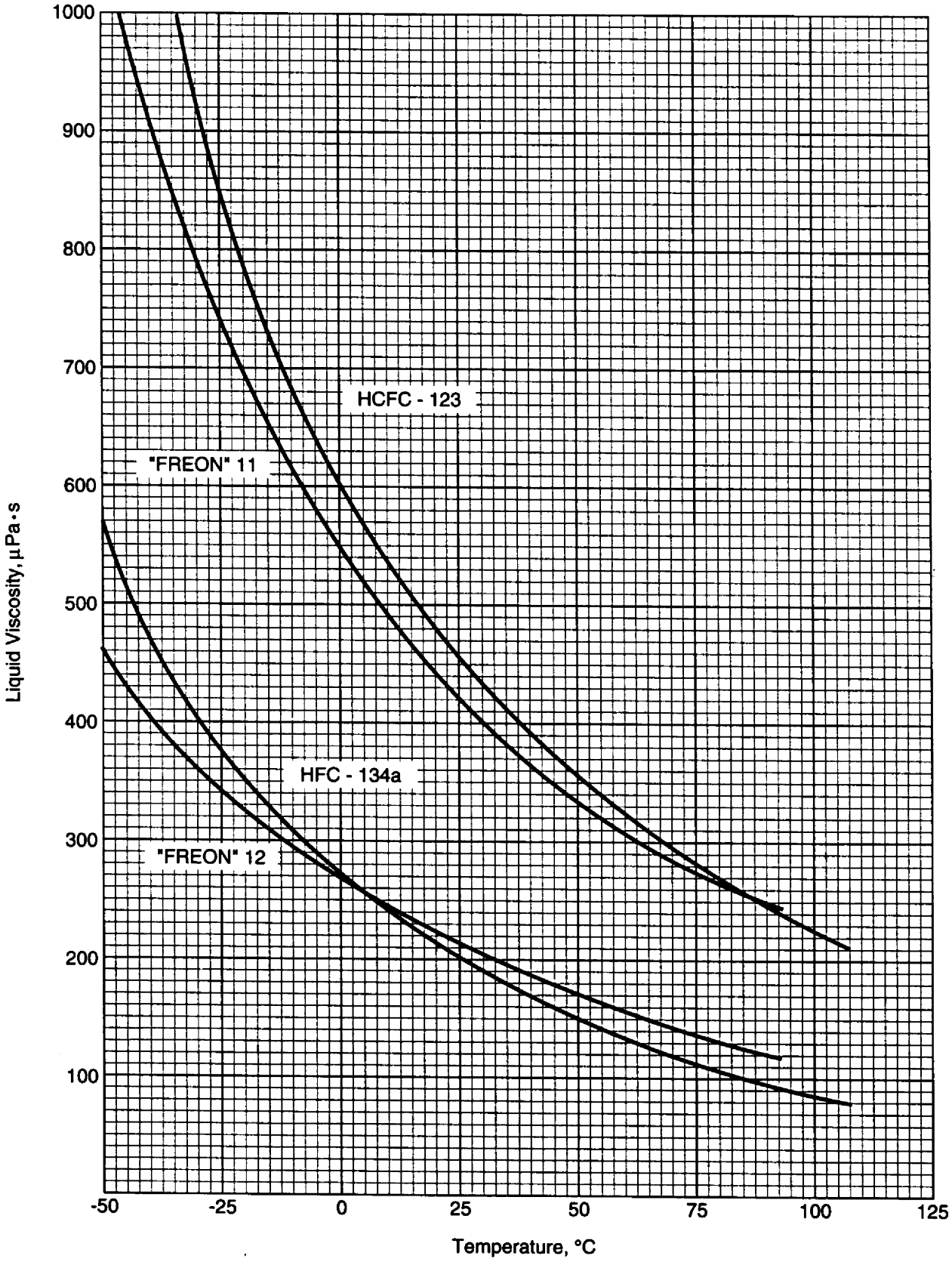
$(100 \le T \le 300°F)$

Vapor Thermal Conductivity in Btu/Lb ft °F

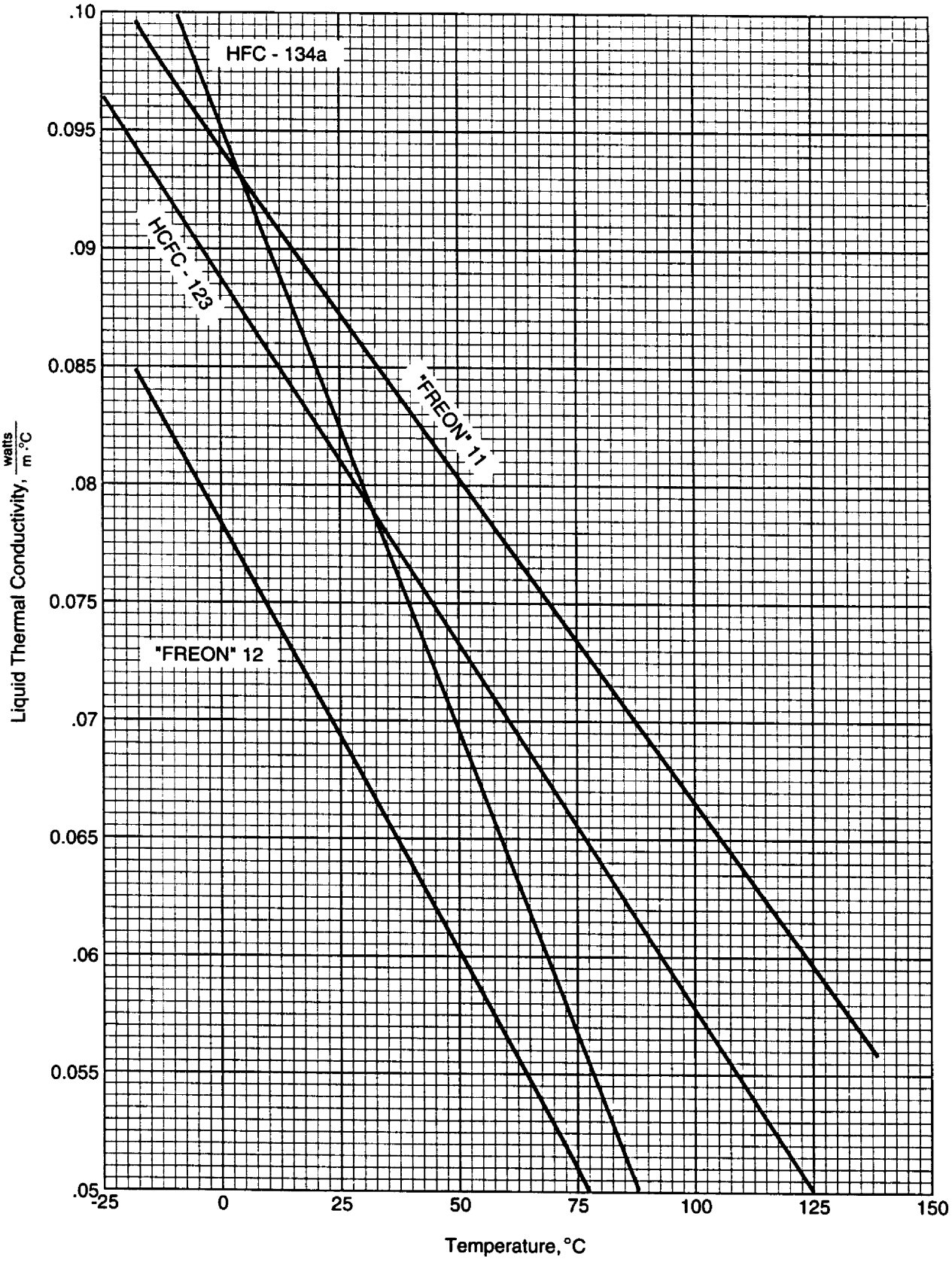
HCFC-123: $k_v = 0.004465 + 0.000025\ T$ $(104 \le T \le 248°F)$

HFC-134a: $k_v = 0.006006 + 0.000031\ T$ $(32 \le T \le 248°F)$

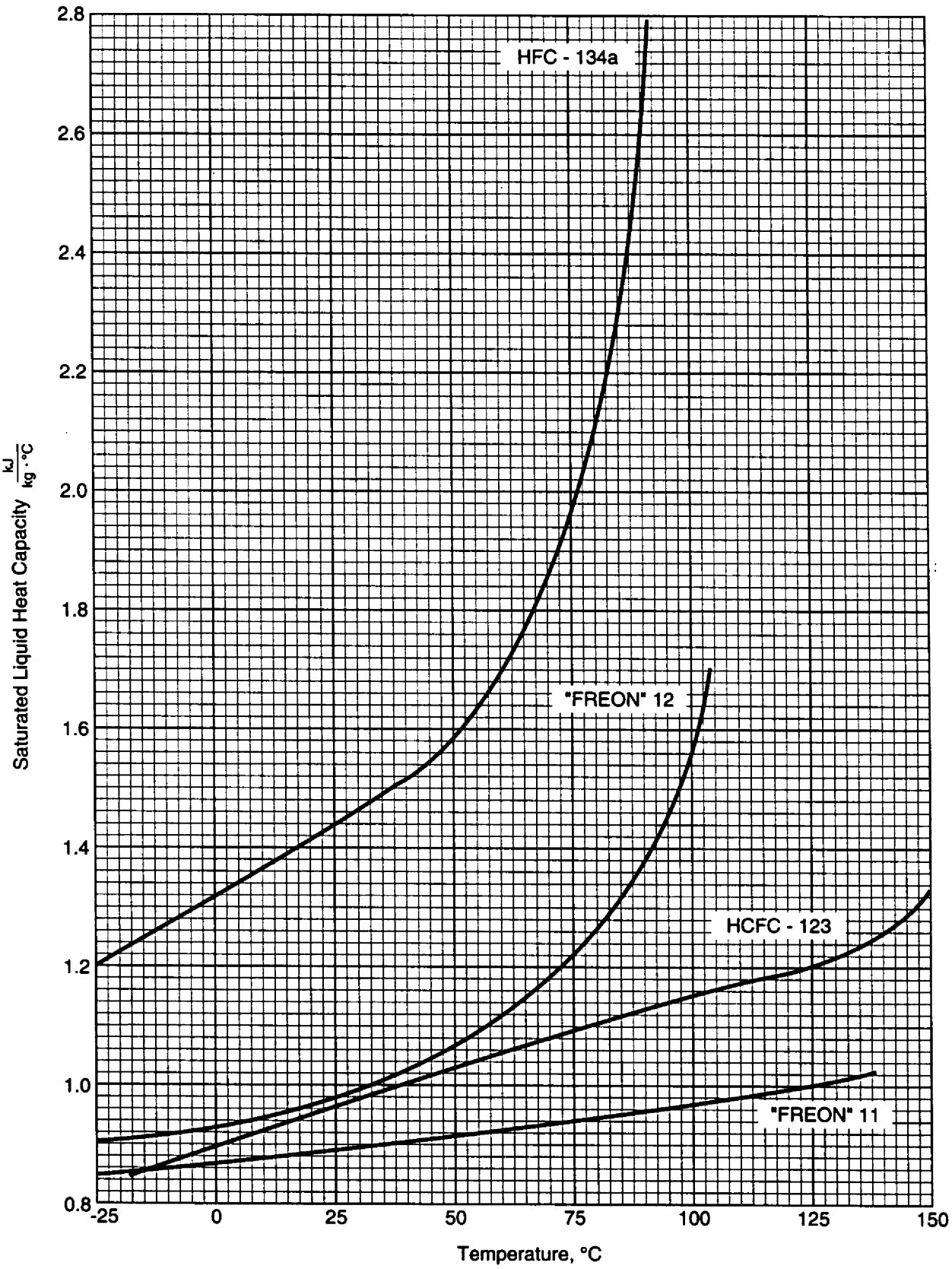
Liquid Viscosity



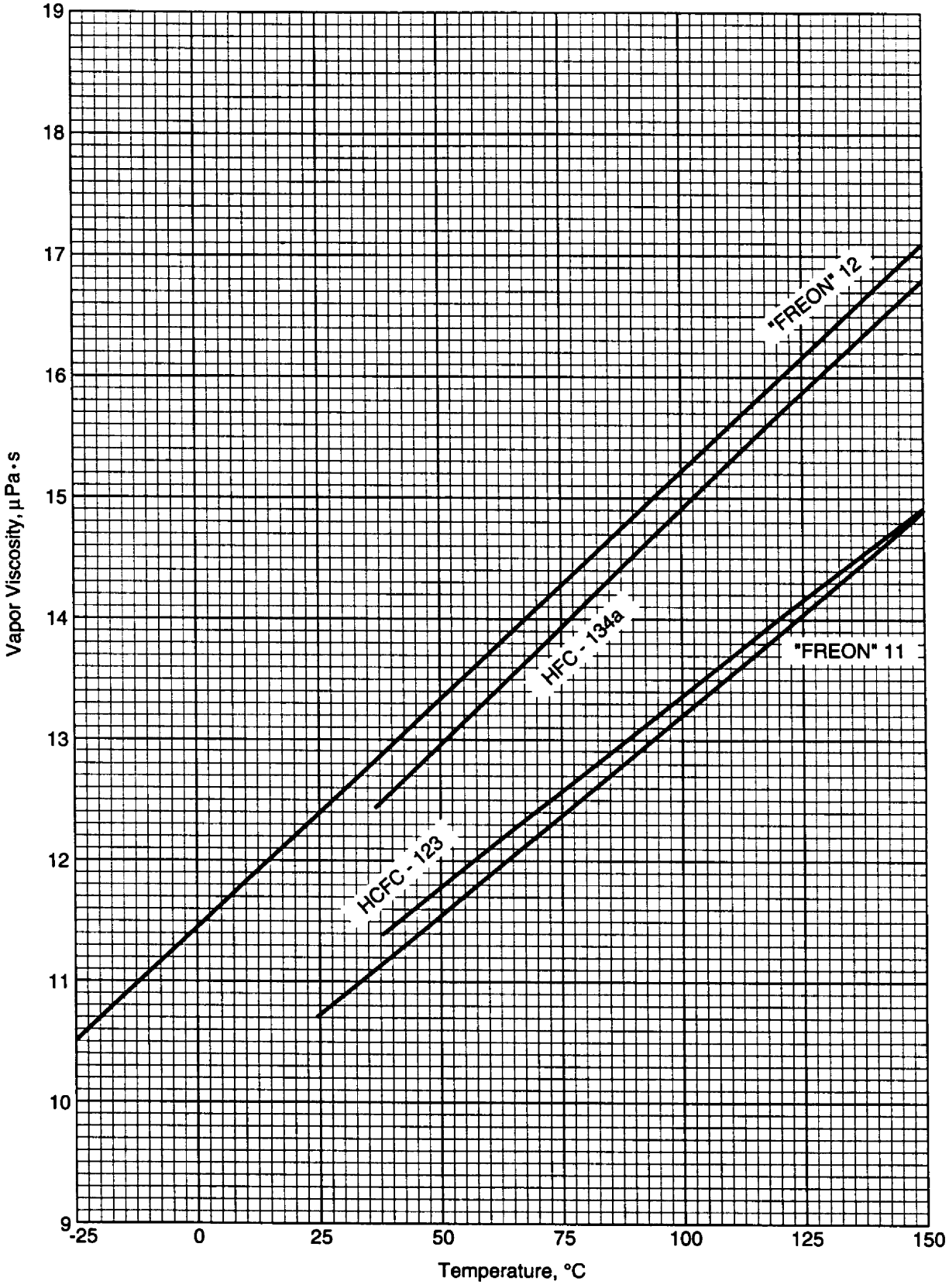
Liquid Thermal Conductivity



Saturated Liquid Heat Capacity



Vapor Viscosity at Atmospheric Pressure



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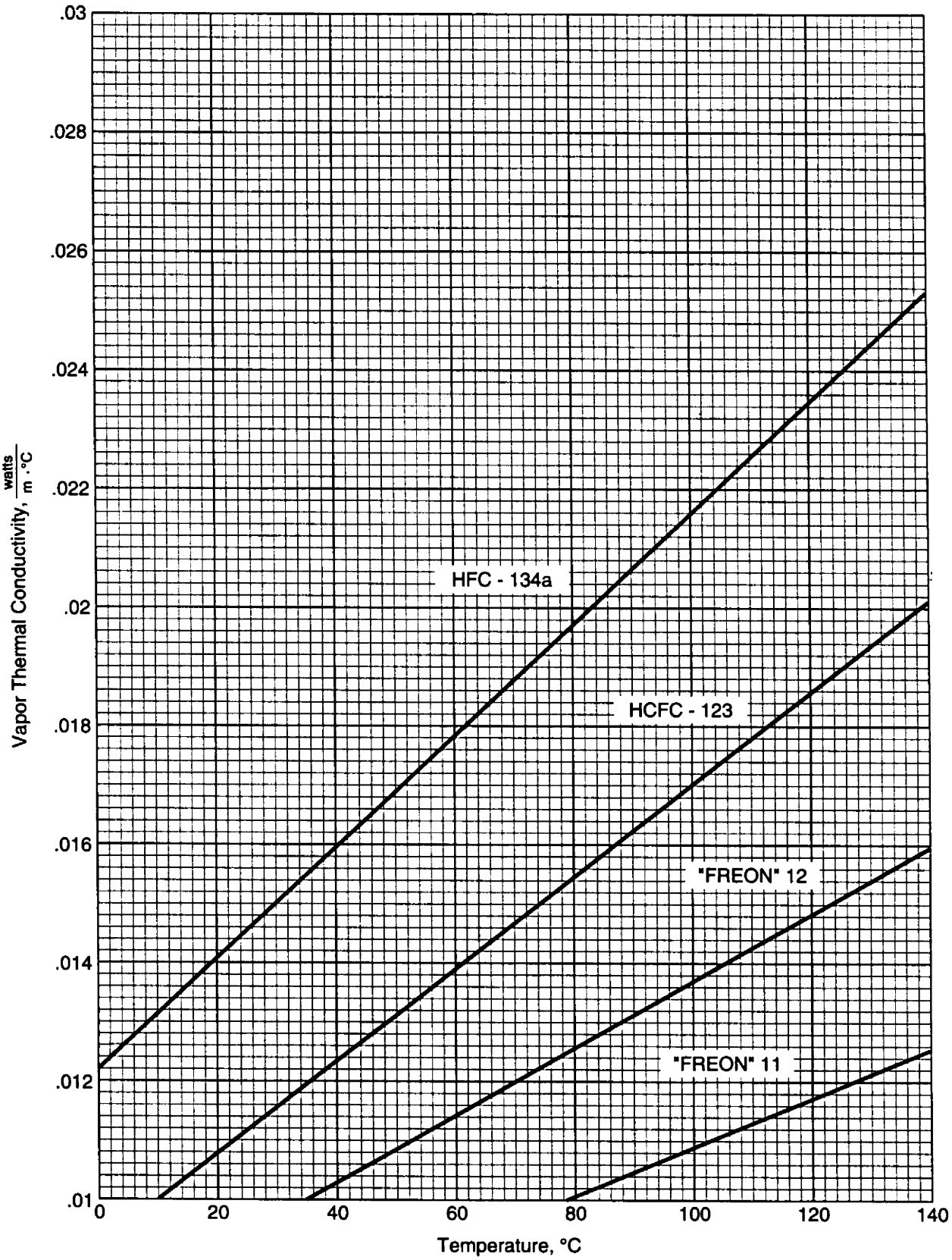
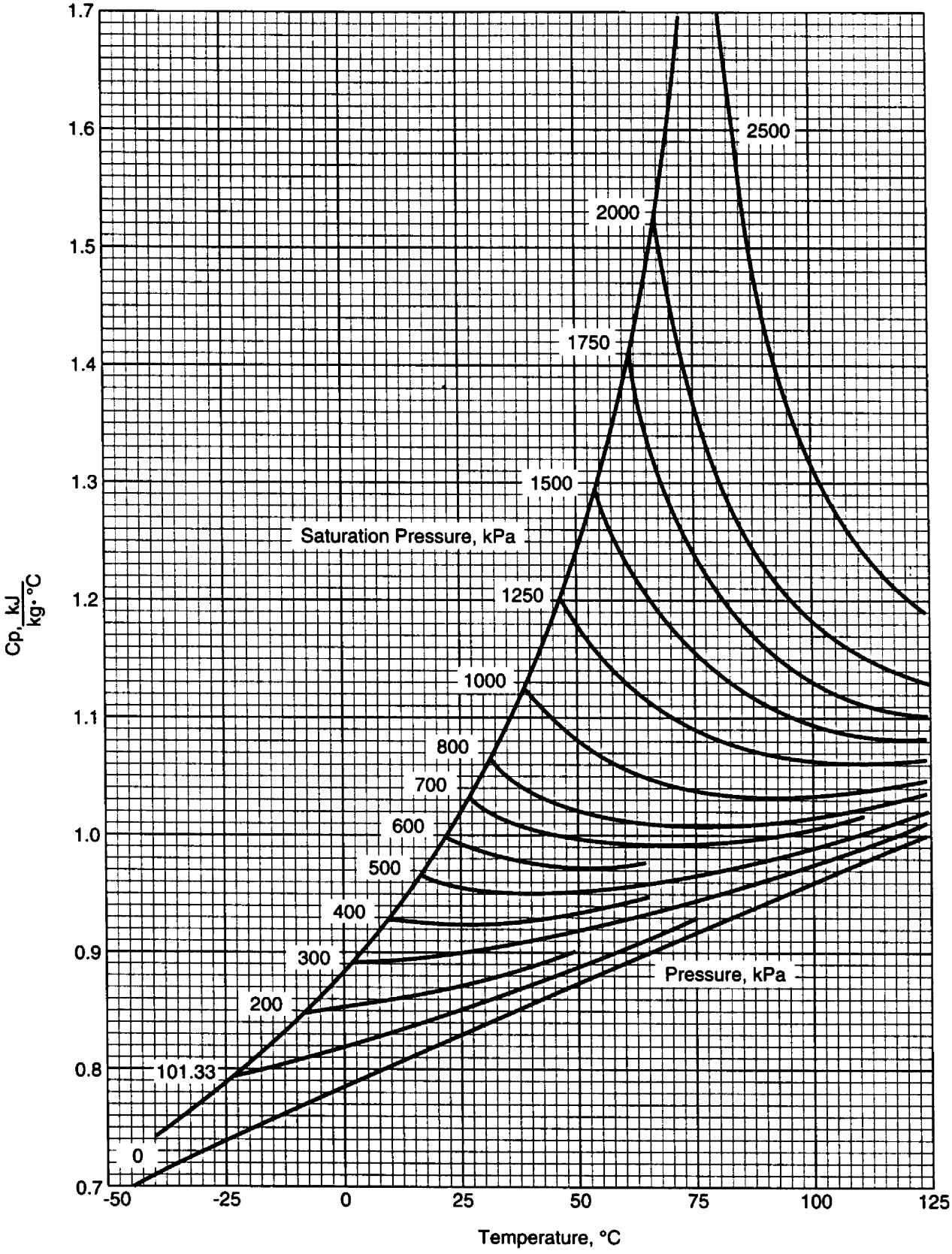
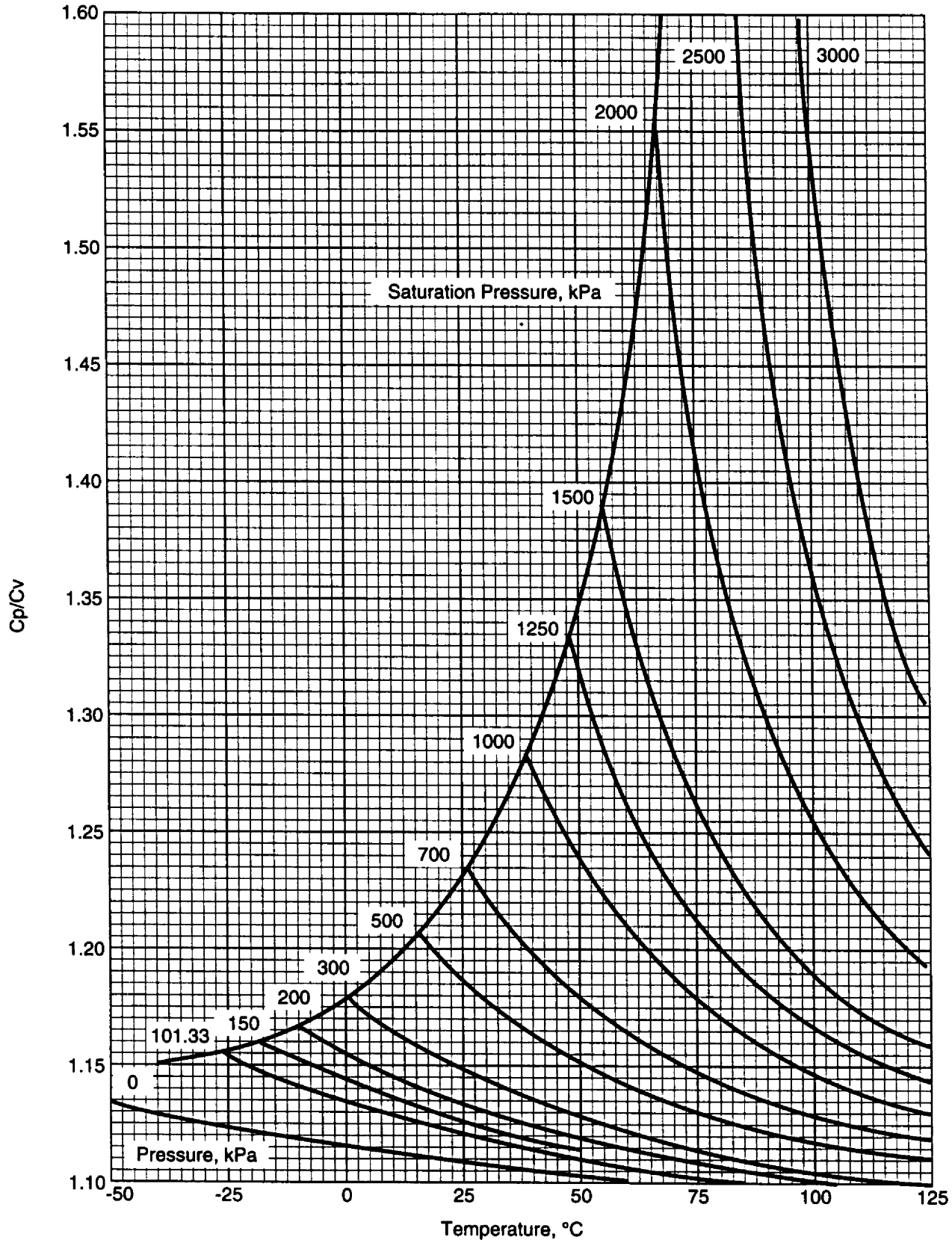


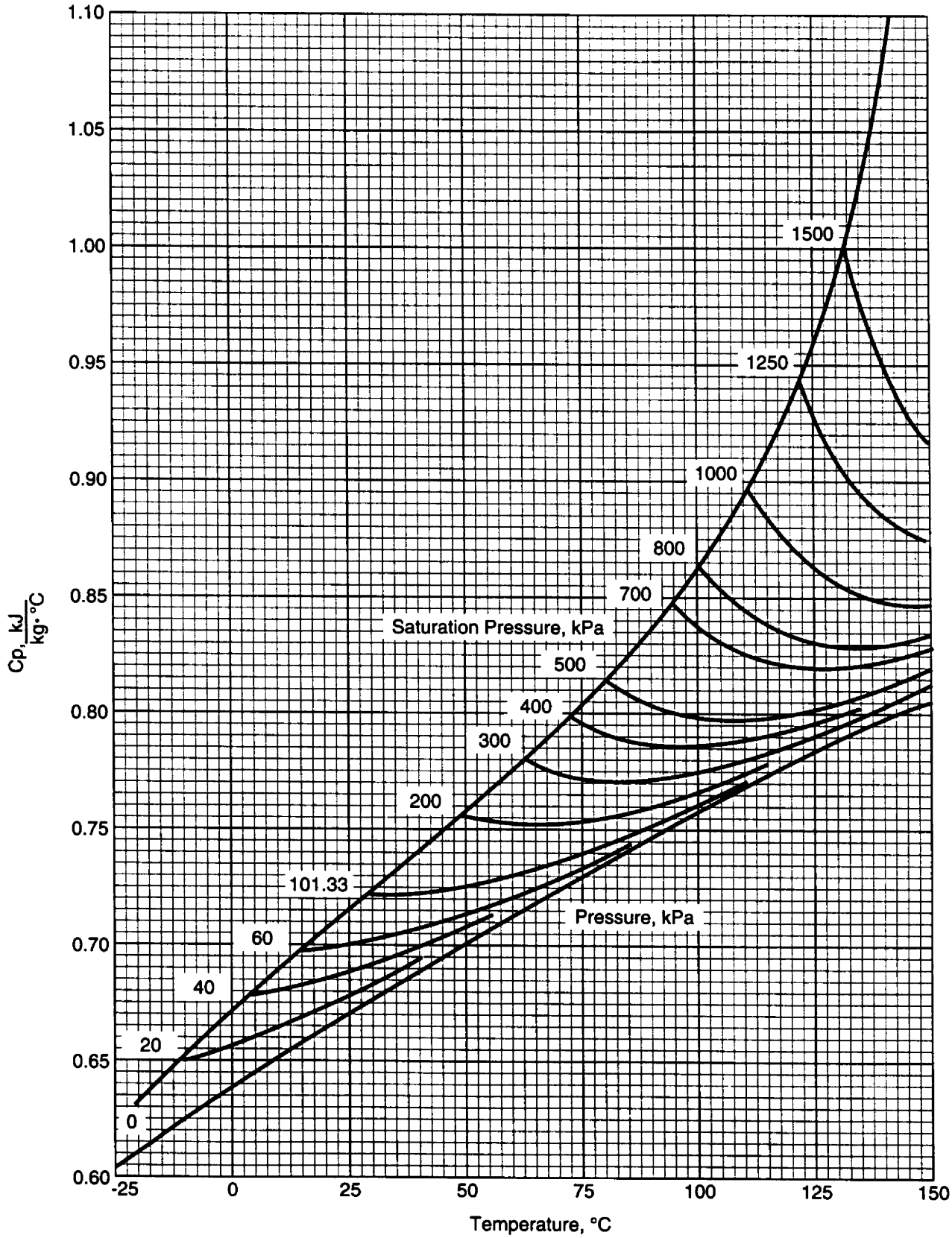
HFC - 134a Vapor Heat Capacity



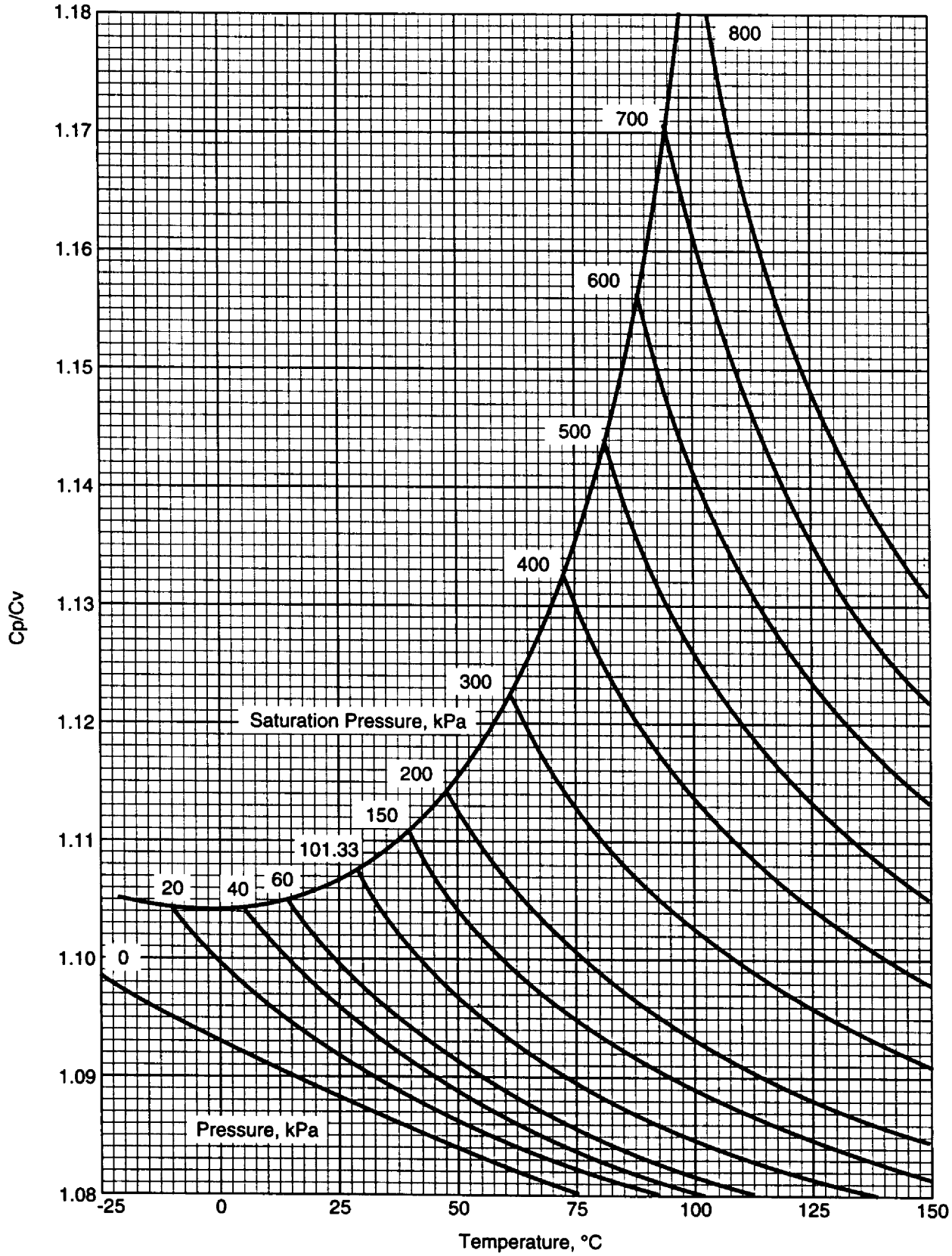
HFC - 134a Vapor Heat Capacity Ratio



HCFC - 123 Vapor Heat Capacity



HCFC - 123 Vapor Heat Capacity Ratio



Equations for Property Estimation

Metric Units

The measured data has been curve-fitted to obtain the following equations for estimation of properties within the ranges specified.

Liquid Viscosity in μPa's

HCFC-123: $\mu_l = -0.0007765T^3 + 0.12886T^2 - 9.0295T + 589.72$

HFC-134a: $\mu_l = -0.0002191T^3 + 0.039304T^2 - 3.6494T + 267.67$

$(-57 \le T \le 93°C)$

Liquid Thermal Conductivity in W/m°C

HCFC-123: $k_l = 0.08908 - 0.000324\ T \quad (-60 \le T \le 120°C)$

HFC-134a: $k_l = 0.09537 - 0.000517\ T \quad (-60 \le T \le 60°C)$

Liquid Heat Capacity in kJ/kg °C

HCFC-123: $c_p = 0.9104 + 0.00257\ T \quad (\text{for } T < 90°C)$

$$c_p = \exp\left[-1515.07 + 354.086 \ln T + \frac{13952.48}{T} - 2.95702T + 0.004074T^2\right]$$

$(\text{for } 90 \le T \le 176.7°C)$

HFC-134a: $c_p = 1.327 + 0.005509T \quad (\text{for } T \le 75°C)$

$$c_p = \exp\left[1979.525 - 374.95752 \ln T - \frac{24459.904}{T} - 1.62846T + 0.015674T^2\right]$$

$(\text{for } 75°C < T \le 100°C)$

Vapor Viscosity in μ Pa's

HCFC-123: $\mu_v = 10.131 + 0.03224T$

HFC-134a: $\mu_v = 11.021 + 0.038599T$

$(38 \le T \le 149°C)$

Vapor Thermal Conductivity in W/m°C

HCFC-123: $k_v = 0.009171 + 0.000077\ T \quad (40 \le T \le 120°C)$

HFC-134a: $k_v = 0.01212 + 0.000096\ T \quad (0 \le T \le 120°C)$

For more information on the Freon™ family of refrigerants, or other refrigerant products, visit freon.com or call (800) 235-7882.

Replaces: H-43855-2
C-11317 (7/17)