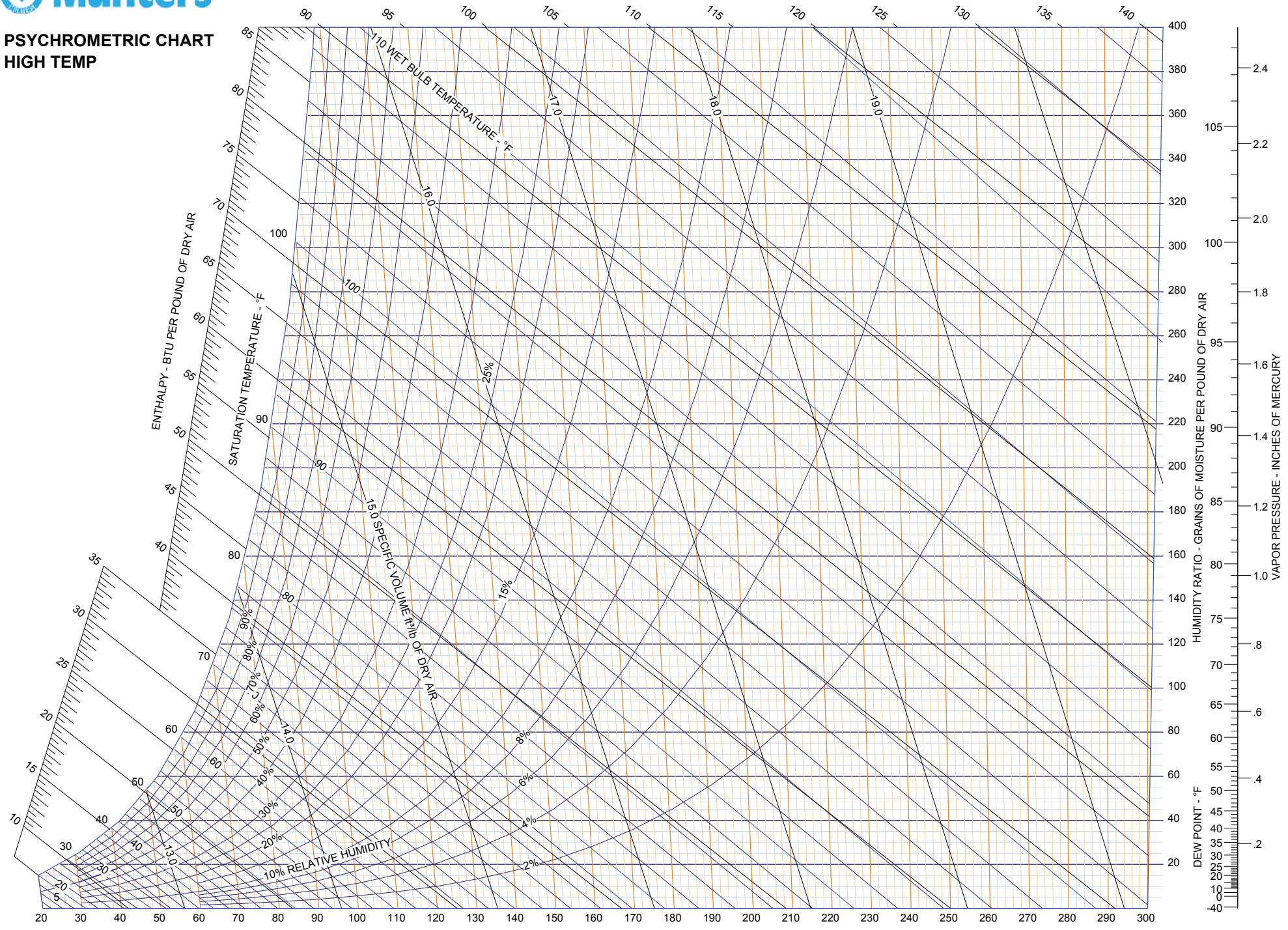
Munters

PSYCHROMETRIC CHART
HIGH TEMP



Linric Company Psychrometric Chart, www.linric.com

FORMULAS AND CONVERSION FACTORS

WATER VAPOR

7,000 grains = 1 lb. of water

1 gallon water = 8.3 lbs.

FUEL-ENERGY CONVERSION

1 kW electricity = 3,412 BTU/hr

1 Ft^3 natural gas = 1,000 BTU

1 gallon #2 fuel oil = 140,000 BTU

1 gallon propane = 91,600 BTU

1 gallon propane = 35.97 ft^3 propane

1 therm = 100,000 BTU/hr

1 kCal/hr = 3.968 BTU/hr

Hp (air) = SCFM *ΔP (in. H_2O) / (6,350 * Eff.)

Hp (water) = GPM *ΔP (ft. H_2O) / (3,960 * Eff.)

SENSIBLE HEATING/COOLING

BTU/hr = lb/hr * Cp * ΔT

BTU/hr = SCFM * 1.08 * ΔT
(Assumes Cp = .24 and density = .075 lb/ft^3)

BTU/hr = 500 * GPM * ΔT

BTU/hr = 4.5 * SCFM * Δh (Total Energy)

BTU/hr = 4,840 * SCFM * ΔHR (Latent Energy)

12,000 BTUs = 1 ton

Tons = 24 * GPM * ΔT (water)

FLOW CONVERSION

SCFM = lb/hr / 4.5

SCFM = ACFM * [530/(460 + T)]

ACFM = SCFM * [(460 + T)/530] (sea level)

Altitude Correction Factor:
[(1 - (0.003566*Alt) / 518.69)^5.26]
(Alt = altitude in feet)

ACFM = SCFM*[(460 + T) / 530] / [(1 - (0.003566*Alt) / 518.69)^5.26]

Nm3/hr = Normal m3/hr = m3/hr measured at 0°C

SCFM = Nm3/hr * 0.634

PRESSURES

27.7 inches W.C. = 1 psi

1 bar = 14.5 psi

1 inch W.C. = 25.4 mm W.C.

THERMAL MATERIAL PROPERTIES

Material	Density (lb / in3)	Coeff of Thermal Expansion (in / in-°F)	Thermal Conductivity (BTU / hr - in - Ft2 - °F)
1100 Aluminum	0.1	13×10^{-6}	1536
Carbon Steel	0.29	7.7×10^{-6}	456
304 Stainless Steel	0.29	10×10^{-6}	105.6

AMBIENT PRESSURE AT ALTITUDE

P (psia) = 14.696* [1 - (6.8754* 10^{-6} * Alt)]$^{5.2559}$

PAYBACK

Yearly savings = MMBTU/hr saved* Yearly hours of operation* Cost of Fuel ($/MMBTU)

Simple payback = equipment cost / yearly savings

HEAT EXCHANGER EFFECTIVENESS

$$\% \eta = \frac{T2-T1}{T3-T1}$$

T1 = cold gas inlet

T2 = cold gas outlet

T3 = hot gas inlet

T4 = hot gas outlet

Valid with equal flows or when cold flow is the smallest

STACK FRICTION LOSS

Friction Loss (in W.C.)/100 ft. of stack = [(0.109136* $q^{1.9)}$] / [$D^{5.02}$]

D = stack diameter in inches

q = Air flow rate in CFM (cubic feet per minute)

Note: These formulae are for reference and estimation purposes only. Assumptions have been made to simplify formulae and conversions.

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