J&W INSTRUMENTS, INC.

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ISO GUIDE 17025
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Stocking Specialty Valve Supplier

SCHUBERT SALZER INC.

Angle Body Blocking and Control Valves
Sliding Gate Control Valves
Regulators, Strainers

ABZ VALVE™ — Automated and High Performance Butterfly Valves	CESCO — Sanitary Safety Relief Valves
DFT INC — Spring Guided Check Valves, Sanitary Threaded and ANSI Flanged End Connections	ESSEX SAFETY — FM Approved - Fusible Link Safety Shut-Off Actuators for Emergency Shut-Down
ITT Industries *Engineered for life* — FM Approved, Fabricated Double Block and Bleed Flame Safe Guard Gas and Oil Valves for Pilots and Main Supply Lines	MEAD Pneumatic Automation Components — Automated Manifold Mounted Solenoid Valves
North American Safety Valve — Kunkle & Consolidated Pressure Safety Relief Valves	RF VALVES "The Best in Pinch Valve Performance!" — Pinch Valves, Knife Gate Valves and Air Water Separator / Vacuum Relief
spirax sarco — Steam Traps, Control Valves, Strainers, Regulators and Misc. Steam Components	PSI Stainless Products, Inc. — Sanitary Blocking & Control Valves, Sanitary Butterfly Valves
TRIAC CONTROLS — A Division of A-T Controls — Manual and Automated Ball Valves, Resilient Seated and High Performance Butterfly Valves	TRU-TECH VALVE — DiaphragmValves Manual & Actuated

Saturated Steam Table

Steam Pressure PSIG	Temp. °F	Sensible Heat BTUH/lb h_f	Latent Heat BTUH/lb h_{fg}	Total Heat BTUH/lb h_g
0	212	180	971	1151
10	239	207	952	1159
25	266	236	934	1170
50	297	267	912	1179
75	320	290	896	1186
100	338	309	881	1190
125	353	325	868	1193
150	365	339	858	1197
200	387	362	838	1200
250	406	381	821	1202
300	422	399	805	1204
400	448	428	778	1206
500	470	453	752	1205
600	489	475	729	1204

Steam

$$C_v = \frac{\text{lbs./hr}}{2.1[(P_2-P_1)(P_1+P_2)]^{1/2}}$$

Liquid

$$C_v = Q\,[S/(P_2-P_1)]^{1/2}$$

Gas

$$C_v = \frac{Q_a\,[G(T_a+460)]^{1/2}}{1360[(P_2-P_1)(P_1+P_2)]^{1/2}}$$

P_1 = Inlet pressure PSIA
P_2 = Outlet pressure PSIA
Q = Gallons per minute
Q_a = Gas flow (SCFH)
C_v = GPM at 1 PSI dP
S = Specific gravity of fluid
G = Specific gravity of gas
T_a = Gas temperature (°F)
t = Time in hours
C_p = Specific heat of liquid
D = Density in lbs/gallon
T_2-T_1 = Temperature change in °F
h_{fg} = Latent heat of steam

Steam Demand Sizing

Steam tracing:
Use 50 lb/hr/100 ft of tracer

Heating water with steam:
lbs/hr = (GPM/2) · (T_2-T_1) or (GPM) · (500) · (T_2-T_1) /h_{fg}

Heating oil with steam:
lbs/hr = (GPM/4) · (T_2-T_1)

Heating air with steam:
lbs/hr = (CFM/900) · (T_2-T_1)

Heating liquids in steam heat exchangers:
lbs/hr = (GPM) · (60) · C_p · D · (T_2-T_1) / h_{fg}

Heating liquids in steam jacketed kettles:
lbs/hr = (Gallons) · S · C_p · D · (T_2-T_1) / (h_{fg} · t)

Common Conversions

Specific gravity of air G = 1
US gallon of water = 8.33 lbs.
1 cubic foot of water = 7.48 gallons
Air specific volume = 1/density = 13.1 ft^3/lb
G of any gas = density of gas/0.076
1 pound of steam = 1 pound of condensate
1 HP = 42.44 BTU per minute
1 BTUH = 12,000 tons of refrigeration
1 GPM = 8.0208 cubic feet per hour

Common Conversions

Specific gravity of water = 1
1 ft^3 of water = 62.34 lbs@ std. condition
1 cubic foot of air = 0.076 lbs.
Air molecular weight M = 29
G of any gas = molecular wt. of gas/29
1 kilowatt-hr = 3,413 BTU
1 pound of water = 0.1198 gallons
1 inch of mercury = 0.4912 psi
1 in of water = 0.03613 psi

Flow conversion of gas

$$\text{SCFH} = \frac{\text{Lbs/hr}}{\text{Density}} \qquad \text{SCFH} = \frac{\text{Lbs/hr} \cdot 379}{M} \qquad \text{SCFH} = \frac{\text{Lbs/hr} \cdot 13.1}{G} \qquad \text{GPM} = \frac{\text{Lbs/hr}}{500 \cdot G}$$

$K_v = C_v \cdot 0.862$

$C_v = K_v / 0.862$

G of gas at flowing temp = $\frac{G \cdot 520}{T_a(°F) + 460}$

Standard conditions are 14.69 psia & 60 °F

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