JASPER

Engineering & Equipment Co.

QUALITY, SERVICE, AND EXPERTISE
SINCE 1958

We engineer your success!

INSTRUMENTATION, HEAT TRACE, AND CONTROL VALVES

SIEMENS

Includes Milltronics, Controlotron, Moore, & Danfoss

- Gauge, differential, & absolute pressure transmitters
- Temperature sensors and transmitters
- Magnetic, vortex, clamp-on, & coriolis flowmeters
- Ultrasonic, radar, capacitance, & guided wave level
- Valve positioners and damper actuators
- Motion sensing & speed switch process protection
- Paramagnetic, laser, IR analyzers, & gas chromatographs

METTLER TOLEDO
INGOLD and THORNTON

- Analytical instrumentation for pure water/ pharma applications & industrial process applications
- Solutions for pH, ORP, conductivity/ resistivity, dissolved oxygen, ozone, carbon dioxide, turbidity, optical density & flow
- Analyzers for TOC & real-time microbial detection, chloride/ sulfate, sodium & silica
- Tunable diode laser (TDL) gas analyzers & amperometric gas-phase oxygen sensors

ABZ VALVE

Butterfly valves: high performance & resilient seated

ACTION INSTRUMENTS | Eurotherm by Schneider Electric

Signal conditioners, temperature transmitters, digital displays

AMI ADVANCED MICRO INSTRUMENTS, INC

High performance analyzers for oxygen and hydrogen sulfide using innovative patented designs

BANNER | sure cross wireless network

Wireless I/O Sensors, Radios, & Nodes

BelGAS A DIVISION OF MARSH BELLOFRAM | BELLOFRAM

Pressure regulators and I/Ps

Dwyer

Hi-Flow valves, transmitters, gauges, & switches

FCI FLUID COMPONENTS INTERNATIONAL LLC

Thermal mass flowmeters, flow & level switches, vortab flow conditioners

GASCO

Calibration gas, precision, mixtures, cylinders, regulators

GREAT PLAINS INDUSTRIES GPI

Turbine, oval gear, impeller flow meters, magnetic flow meters, BTU calculators and displays

HAWK

Guided wave radar for interface and high level measurements. Fiber Optic Sensing for strain and conveyor health monitoring, Sonar Sludge Level Monitoring, Blocked Chute Protection, and Wireless Communication.

INDELAC CONTROLS, INC.

Explosion proof & general purpose electric fail-safe valve actuation

K-TEK

Flow & energy computers, process indicators & sensors, batch controllers, counters, timers, totalizers, HMI's, & flat panel monitors

MERCER VALVE CO., INC.®

Conventional & pilot operated safety relief valves for gas service, featuring "auto seat technology"

MIDWEST AUTOMATION Solutions

High performance & resilient Seated butterfly valves; ball valves

OmniSite CELLULAR MONITORING SOLUTIONS

Remote alarm monitoring & lift station control

OPTI-FLOAT

Submersible level detectors, lift station retro-fits, & level controls

PRATT

Butterfly valves: high performance & resilient seated

PRECISION DIGITAL

Flow, level, pressure & temperature displays, indicators, totalizers, transmitter, & batch controllers

pyromation beyond measure

RTD's, thermocouples, wells, & temperature transmitters

RASCHIG

Tower packing, trays, & mist eliminators

SH SCHMIDT HAENSCH

Inline process refractometers concentration measurement

INSTRUMENTATION, HEAT TRACE, & CONTROL VALVES CONTINUED

SoundWater Only Excellence

Portable clamp on ultrasonic transit time flow meters

RLE Technologies

Liquid leak detection systems, wired & wireless web-based monitoring solutions, & raised floor airflow management

UE

Pressure & temperature switches, transmitters, sensors, and controls for safety, alarm and shutdown; wireless gas detection

TELEDYNE DETCON
OLDHAM SIMTRONICS GMI

Industrial grade, gas detection systems

CONVERSIONS, FORMULAS, & ENGINEERING DATA

Pressure Conversions
1 PSI = 27.71 inches water
1 PSI = 2.0418 in. Hg @ 60F
1 PSI = 51.81 mm Hg @ 60F
1 PSI = .0689 bar
1 PSI = 6.895 kPa
1 inch water = 1.8718 mm Hg
1 inch water = .2489 kPa

Volume Conversions
1 Gallon = .1337 cubic feet
1 Gallon = 231 cubic inches
1 Gallon = .003785 cubic meters
1 Gallon = 3.785 liters
1 Barrel (oil) = 42 gallons
1 Bushel = 1.2445 cubic feet

Mass Conversions
1 lb. = .4536 Kg
1 Ton (short) = 2000 lbs.

Volumetric Flow
1 GPM = .227 cubic meters/hour
1 GPM = 3.785 liters per minute

Water Density
At 60 degrees F = 62.371 lbs/ft.
At 60 degrees F = 8.3378 lbs./gal.

Flow Velocity of Water
V(ft./second) = .4086*Q/D*D
Q is flow in GPM
D is pipe ID in inches

Flow Velocity of Gas
V = 3.056*Q/D*D
V is flow velocity in SFPS
Q is flow in SCFM
D is pipe ID in inches

Volumetric Gas Flow
SCFM = ACFM*(pf*520)/(14.7*Tf)
Pf = Pressure at flow conditions PSIA
Tf = Temp. at flow conditions Deg. R

Volumetric to Mass Flow of Water
33F water, 8.325 lb./gallon density
Q(GPM) = Q(lbs/hour)*.002

Distance
1 inch = 2.54 centimeters
1 foot = .3048 meters

Pressure
PSI (absolute) = PSI (gauge) +14.696

Steam Data

Gage Press. PSIG	Temp Spec. Deg. F	Volume Cubic ft/minute
0.0	212	26.8
25.3	267.25	10.5
50.3	297.97	6.66
100	337.90	3.88
150	365.99	2.75
200.3	377.89	2.13
250.3	406.13	1.74

Table of Liquid Flows in Schedule 40 Pipe

Pipe Size	GPM at 3 fps	GPM at 15 fps
1	8.086	40.43
1.5	19.026	95.13
2	31.358	156.79
3	69.12	345.6
4	119.046	595.23
6	270.27	1351.35
8	468.748	2343.74
10	738.342	3691.71
12	1044.78	5223.88
16	1651.38	8256.88
24	3761.76	18,808.78

Control Valve Sizing
Liquid - Cv = q*Ã(gf/DP)
Steam - Cv = W/(2.1*Ã(DP(Pf1+Pf2))
Gas - CV = Q/963*Ã((G*Tf/DP(Pf1+Pf2))
q is GPM, Ã is Square Root
gf is liquid specific gravity
DP is Differential pressure
W is steam flow rate lbs./hr
Pf1 upstream pressure in psia
Pf2 downstream pressure in psia
Q is gas flow rate

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