

PRESSURE AND LIQUID HEAD

	Kilogram force per square centimetre	Pound force per square inch		Foot of water		Inch of water	Metre of water	Centimetre of mercury	Inch of mercury	Millimetre of mercury
1	2	3	4	5						6
barg	kgf/cm ²	lbf/in ²	atm	ft H ₂ O		in H ₂ O	m H ₂ O	cm Hg	in Hg	mm Hg
1	1.0197	14.5038	0.9869	33.4553		401.463	10.1972	75.0062	29.530	750.062
0.9807	1	14.2233	0.9878	32.8084		393.701	10	73.556	28.959	735.559
0.0689	0.0703	1	0.0609	2.3067		27.68	0.7031	5.1715	2.036	51.715
1.0133	1.0332	14.6959	1	33.889		406.782	10.3323	76.0	29.9213	760
0.0299	0.0305	0.4335	0.0295	1		12	0.3048	2.242	0.8827	22.4198
0.0025	0.0025	0.0361	0.0025	0.0833		1	0.0254	0.1868	0.0734	1.8683
0.0981	0.1	1.422	0.0968	3.2808		39.3701	1	7.3556	2.896	73.356
0.0133	0.0136	0.1934	0.0132	0.4461		5.3524	0.136	1	0.3937	10
0.0339	0.0345	0.4911	0.0334	1.133		13.5951	0.3453	2.54	1	25.4
0.0013	0.0014	0.0193	0.0013	0.446		0.5352	0.0136	0.1	0.0394	1

- 11 barg = 105N/m²
- 2 Technical (metric) atmosphere (atm)
- 3 Often denoted non-technically as psi
- 4 International standard atmosphere
- 5 At density 1g/cm³
- 6 Also known as torr

STANDARD GAS CONDITIONS AND MODULAR VOLUMES

Normal (e.g. nft ³) - European and scientific work	= 0°C and 1.0133 barg
Standard (e.g. std ft ³) - British Gas Industry	= 15.55°C and 1.016 barg
Standard (scf) - USA	= 15.55°C and 1.0133 barg

PRESSURE STANDARDS

International standard atmosphere	(1 atm) = 1.0133 barg = 1.0332 kgf/cm ² = 14.6959 lbf/in ²
Metric atmosphere	(1 atm) = 0.9807 barg = absolute w = 14.2233 lbf/in ² ata = at absolute w atu = at gauge
Standard conditions – s.t.p. or NTP	= 1.0133 barg 0°C = 14.6959 lbf/in ² at 0°C

DENSITY

Gram per millilitre g/ml	Kilogram per cubic metre kg/m ³	Pound per cubic foot lb/ft ³	Pound per cubic inch lb/in ³
1	1000	62.428	0.0361
0.001	1	0.0624	0.000036
0.016	16.02	1	0.00058
27.6807	27679.9	1728	1

HEAT FLOW RATE

Watts W	Calorie per second cal/s	Kilocalorie per hour kcal/h	British Thermal unit per hour BTU/h
1	0.2388	0.8598	3.4121
4.1868	1	3.6	14.286
1.163	0.2778	1	3.9683
0.231	0.07	0.252	1

FORCE

Kilonewton kN	Kilogram force kgf	Pound force lbf	Poundal pdl
1	101.972	224.809	7233.01
0.00981	1	2.2046	70.9316
0.0044	0.4536	1	32.174
0.000138	0.0141	0.0311	1

POWER

Watt W	Kilogram force metre per second kgf m/s	Metric horse power	Foot pound force per second ft lbf/s	Horse power hp
1	0.102	0.00136	0.7376	0.00134
9.8067	1	0.01333	7.233	0.01315
735.499	75	1	542.476	0.98632
1.3558	0.1383	0.00184	1	0.00182
745.70	76.0402	0.0139	550.0	1

MASS/VOLUMETRIC RATE OF FLOW FORMULAE

Gases			
$\text{ft}^3/\text{h (std)} = \frac{\text{lb/h} \times 379}{M}$		$\text{m}^3/\text{h (norm)} = \frac{\text{kg/h} \times 22.40}{M}$	
$\text{ft}^3/\text{h (std)} = \frac{\text{lb/h}}{p1}$		$\text{m}^3/\text{h (norm)} = \frac{\text{kg/h}}{p2}$	
$\text{ft}^3/\text{h (std)} = \frac{\text{lb/h} \times 13.1}{G1}$		$\text{m}^3/\text{h (norm)} = \frac{\text{kg/h} \times 0.82}{G2}$	

TORQUE

Newton metre Nm	Kilogram force metre kgf m	Pound force feet lbf ft	Pound force inch lbf in
1	0.102	0.7376	8.8508
9.8067	1	7.233	86.7962
1.3558	0.1383	1	12
0.113	0.0115	0.0833	1

LIQUIDS

$\text{US gal/min} = \frac{\text{lb/h}}{50 \times \text{SG}}$		$\text{m}^3/\text{h (norm)} = \frac{0.001 \text{ kg/h}}{\text{SG2}}$
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Where:
(std) is at 14.7 lbf/in² (abs) and 60°F
(norm) is at 760 mm Hg and 0°C
SG1 Water = 1 at 60°F
SG2 Water = 1 at 4°C
M = Molecular Weight
p1 = Density lb/ft³ (std)
p2 = Density kg/cm³ (norm)
G1 = sp.gr. Air = 1 (std)
G2 = sp.gr. Air = 1 (norm)

CONVERSION TABLE FOR SPECIFIC ENTHALPY

	kJ/kg = J/g	kJ/kg = cal/g	BTU/lb		kgf m/kg	ft lbf/lb	kWh/kg = Wh/g
1 kJ/kg	*1	0.238846	0.429923		101.972	334.553	2.777 78 x 10 ⁻⁴
1 kcal/kg	*4.186 8	*1	*1.8		426.935	1400.70	*1.163 x 10 ⁻³
1 BTU/lb	*2.326	0.555556	*1		237.186	778.169	6.461 11 x 10 ⁻⁴
1 kgf m/kg	*9.806 65 x 10 ⁻³	2.342 28 x 10 ⁻³	4.216 10 x 10 ⁻³		*1	3.28084	2.724 07 x 10 ⁻⁶
1 ft lbf/lb	2.989 07 x 10 ⁻³	7.139 26 x 10 ⁻⁴	1.285 07 x 10 ⁻³		*0.304 8	*1	0.830 296 x 10 ⁻⁶
1 kWh/kg	*3600	859.845	1547.72		3.670 98 x 105	1.204 39 x 106	*1

SPECIFIC GRAVITY AND MOLECULAR WEIGHT OF GASES

Gas	Symbol	Specific Gravity	Molecular Weights
Air		1.000	28.97
Ammonia	NH ₃	0.5963	17.03
Carbon Dioxide	CO ₂	1.529	44.00
Carbon Monoxide	CO	0.967	28.00
Chlorine	Cl ₂	2.486	70.91
Ethylene	C ₂ H ₄	0.9749	28.03
Helium	He	0.138	4.00
Hydrogen	H ₂	0.0695	2.016
Hydrogen Sulphide	H ₂ S	1.19	34.08
Methane	CH ₄	0.5544	16.03
Methyl Chloride	CH ₃ Cl	1.7848	50.48
Nitrogen	N ₂	0.9672	28.02
Nitrous Oxide	N ₂ O	1.530	44.02
Oxygen	O ₂	1.105	32.00
Sulphur Dioxide	SO ₂	2.264	64.06
Natural Gas (typical)		0.60	

SPECIFIC GRAVITY OF LIQUIDS

Water	1.0
Sea Water	1.025
Kerosene	0.80
Sulphuric Acid 100%	1.83
Hydrochloric Acid 45%	1.48
Sodium Hydroxide 25%	1.27
Carbon Tetrachloride	1.60
Petrol (Gasoline)	0.65-0.80
Benzene	0.88
Turpentine	1.1-1.2