Quick Reference for Oil & Gas Measurement

PETEX

THE UNIVERSITY OF TEXAS AT AUSTIN
PETROLEUM EXTENSION SERVICE

The measurement needs of the oil and gas industry differ from those found in most mathematic guides and conversion tables. The purpose of this booklet is to provide you with the comprehensive information needed to understand and perform measurement tasks.

Included in this booklet are:

- Mathematical Symbols and Signs
- Measurement Abbreviations
- Numerical Prefixes
- International System of Units—SI
- Conversion Tables
- Temperature Conversion in Degrees
- API Gravity Conversions

It is PETEX's goal to provide the best in training materials to the petroleum industry. I hope this booklet will be useful to you on the job and that you will consider coming to PETEX for your future training needs.

Peter Kosewicz
Assistant Director
PETEX

Mathematical Symbols and Signs

absolute value of *x*	$\|x\|$
addition (plus)	+
angle	$\angle$
approaches	$\rightarrow$
cube root	$\sqrt[3]{}$
degrees	°
delta (difference)	Δ
differential of *x*	dx
divided by	/
division	÷
equal to or greater than	≥
equal to or less than	≤
equals	=
equals approximately	≈
functions of *x*	$f(x)$, $F(x)$
greater than	>
identical with	≡
increments of *x*	Δx
infinity	∞
integral of	$\int$
integral of, between limits a and b	$\int_a^b$
length of line from A to B	$\overline{AB}$
less than	<
micron	μ
minutes	'

Measurement Abbreviations

°/s	degrees per second
µm	micrometres
amp, A	ampere
atm	atmosphere. Standard pressure at sea level
bar	unit of pressure. Not SI
bbl	barrels liquid
bbl, bbls	barrel, barrels
bbl/d, BPD	barrels per day
bbl/h, BPH	barrels per hour
°Bé	degrees in Baumé hydrometer scale
bp	boiling point
Btu	British thermal unit
Btu/min	British thermal unit per minute
C	Celsius
cfm	cubic feet per minute
cfs	cubic feet per second
cm	centimetre
cm/s	centimetres per second
cm^3	cubic centimetre
cmHg	centimetre of mercury at 0°C
cpm	cycles per minute
cps	cycles per second (hertz)
deg	degree
dia	diameter
dwf troy	pennyweights
F	Fahrenheit
ft	feet
ft • lbf	foot pounds force
ft/min, fpm	feet per minute

Numerical Prefixes

Symbol	Prefix	Value
E	exa	10^{18}
P	peta	10^{15}
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
h	hecto	10^{2}
da	deca, deka	10^{1}
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

International System of Units—SI

Quantity	Formula	Symbol	Unit
		BASE UNITS	
length		m	metre
mass		kg	kilogram
time		s	second
electric current		A	ampere
thermodynamic temperature		K	Kelvin
amount of substance		mol	mole
luminous intensity		cd	candela
		SUPPLEMENTARY UNITS	
plane angle	$m \cdot m^{-1} = 1$	rad	radian
solid angle	$m^2 \cdot m^{-2} = 1$	sr	steradian
		DERIVED UNITS	
acceleration		m/s^2	metre per second squared
activity of a radioactive source	(disintegration)/s		disintegration per second
amount of substance concentration		mol/m^3	mole per cubic metre
angular acceleration	rad/s^2		radian per second squared
angular momentum	$kg \cdot m^2/s$		kilogram metre squared per second
angular velocity	rad/s		radian per second
apparent mass of fluid		AM_{fl}	grams
area	m^2		square metre

Conversion Tables

Convert From		To	Multiply by
atmospheres—atm	kPa	kilopascals absolute	101.325
	pfsia	pounds force per square inch absolute	14.696
	cmHg	centimetres of mercury at 0°C	76.00
	inHg	inches of mercury at 0°C	29.92
	ftH_2O	feet of water at 68°F	33.96
	bar	bars absolute (unit of pressure)	1.01325
	kgf/cm^2	kilograms force per square centimetre absolute	1.0332
	$tonf/ft^2$	tons force per square foot absolute	1.0581
	torr	Torr (= mmHg at 0°C)	760
barrels, liquid U.S. (bbl)	m^3	cubic metre	0.11924
	U.S. gal	U.S. gallons liquid	31.5
barrels, petroleum (bbl)*	m^3	cubic metre	0.15899
	U.S. gal	U.S. gallons	42†
	in^3	cubic inches	9702†
	ft^3	cubic feet	5.61458
	L	litres	158.987
bars (bar)	kPa	kilopascals	100
	psi	pounds per square inch	14.504
	ftH_2O	feet of water at 68°F	33.52
	inHg	inches of mercury at 0°C	29.53
	kgf/cm^2	kilograms force per square centimetre	1.0197
	atm	atmospheres sea-level standard	0.98692
	$tonf/ft^2$	tons force per square foot absolute	1.0443
	torr	Torr (= mmHg at 0°C)	750.06

† This relationship is exact by definition.

* These factors are solely for conversion at the same temperature.

Temperature Conversion in Degrees

Fahrenheit to Celsius

$$°C = \left(\frac{5}{9}\right) \times (°F - 32)$$

Celsius to Fahrenheit

$$°F = \left(\frac{9}{5}\right) °C + 32$$

API Gravity Conversions

Results are always converted to the values at 60°F (standard temperature) for liquid temperatures other than 60°F.

$$\text{API Gravity at 60°F} = \frac{141.5}{\text{Relative Density at 60°/60°F}} - 131.5$$

$$\text{Relative Density at 60°F} = \frac{141.5}{\text{API Gravity at 60°F} + 131.5}$$

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