

EPRI
Standardized Task Evaluation

Resource Guide

STE IC04.01
Calibrate General Instrumentation

Print this document to accompany IC04.01 written exam

**For best results, this document should be printed in either
color or grayscale, not black and white.**

Calibration Data Record

JOB: (1) _____

INSTRUMENT I.D.: (2) _____ MANUFACTURER: (3) _____

SERVICE: (4) _____

MODEL: (5) _____ SERIAL NUMBER: (6) _____

INPUT: (7) _____ OUTPUT: (8) _____

CALIBRATION DATA: (9) _____

REMARKS: (10) _____

PERFORMED BY: (11) _____ DATE: (12) _____

TEST EQUIPMENT	MODEL	S/N
(13)	(14)	(15)

INPUT: (16) _____ OUTPUT: (17) _____

%	VALUE	DESIRED	AS FOUND	AS LEFT
0				
25				
50				
(18)	(19)	(20)	(21)	(22)
75				
50				
25				
0				

Figure 2

Typical Instrument ID Letter Combinations

1st Letter	Measured Variable	Controllers			Readout Devices		Switches and Alarm Devices			Transmitters			Solenoids Relays Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Control Element
		Recording	Indicating	Blind	Self Actuated Valves	Recording	Indicating	High	Low	Combo	Recording	Indicating							
A	Analysis	ARC	AIC	AC	AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner Combustion	BRC	BIC	BC	BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	Users Choice																		
E	Voltage	ERC	EIC	EC	ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow	FRC	FIC	FC	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP	FG			FV
G	Users Choice																		
H	Hand	HRC	HIC	HC					HS										HV
I	Current	IRC	IIC	IC	IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC	JC	JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE		LW	LG		LV
M	Users																		
N	Users Choice																		
O	Users Choice																		
P	Pressure	PRC	PIC	PC	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure Differential	PDRC	PDIC	PDC	PDR	PDI	PDSH	PDSL	PDSHL	PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	Quantity	QRC	QIC	QC	QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	Radiation	RRC	RIC	RC	RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	Speed Frequency	SRC	SIC	SC	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	Temperature	TRC	TIC	TC	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW			TV
TD	Temperature Differential	TDRC	TDIC	TDC	TDR	TDI	TDSH	TDSL	TDSHL	TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	Multi Variable				UR	UI							UY						UV
V	Vibration Machinery				VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	Weight	WRC	WIC	WC	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	Weight Differential	WDR	WDIC	WDC	WDR	WDI	WDSH	WDSL	WDSHL	WDRT	WDIT	WDT	WDY	WE					WDZ
X	Unclassified																		
Y	Event State Presence	YRC	YIC	YC	YR	YI	YSH	YSL	YSHL	YRT	YIT	YT	YY	YE					YZ
Z	Position Dimension	ZRC	ZIC	ZC	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	Gauging Deviation	ZDRC	ZDIC	ZDC	ZDR	ZDI	ZDSH	ZDSL	ZDSHL	ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

Instrument Line Symbols and Identifiers

1. Instrument supply or connection to process	
2. Undefined signal	
3. Pneumatic signal	
4. Electric signal	
5. Hydraulic signal	
6. Capillary tube	
7. Electromagnetic or sonic signal (guided)	
8. Electromagnetic or sonic signal (not guided)	
9. Internal system link (software)	
10. Mechanical link	
11. Pneumatic binary signal	
12. Electric binary signal	

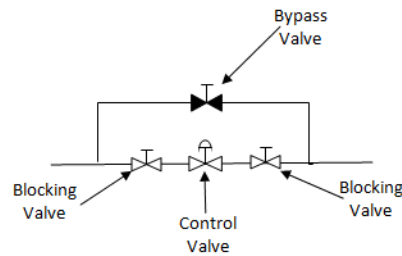
Instrument Function Symbols

	Primary location normally accessible to operator	Field mounted	Auxiliary location normally accessible to operator
Discrete instruments			
Shared display Shared control			
Computer function			
Programmable logic control			













Inaccessible or behind-the-panel devices or functions are usually shown with internal dashed lines

Control Valve Symbols

Globe:		Three-way:	
Alternative:		Four-way:	
Gate:		Alternative:	
Alternative:		Check:	
Ball:		Alternatives:	
Alternative:		Stop Check:	
Needle:		Alternatives:	
Alternatives:		Angle:	
Butterfly:		Rupture Disc:	
Alternatives:		Alternatives:	
Plug:		Throttled valve:	
Diaphragm:		Locked open valve:	
Alternative:		Locked closed valve:	
Pipe reducer:		Valve fails open:	
Relief:		Valve fails closed:	
Alternatives:		Three-way valve with one port open, one port closed:	
Flow control valve:		Valve fail as is:	
Temperature control valve:			
Level control valve:			
Pressure control valve:			
Pressure regulator:			
Closed valve:			
Open valve:			


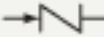




















Control Valve Actuator Symbols






































Fail Locked:	
Fail Open:	
Fail Closed:	
Diaphragm:	
Alternative:	
Electric Motor:	
Solenoid:	
Alternative:	
Piston:	
Alternative:	
Reachrod:	
Manual:	

For Class Only
NOT FOR TESTING

Pipe Fitting Symbology

FITTINGS & VALVES	MISC. VALVES
 Union	 Check valve
ANGLE VALVES	 Cock valve
 Check	 Diaphragm valve
 Gate (elevation)	 Float valve
 Gate (plan)	 Gate valve
 Globe (elevation)	 Motor operated
 Globe (plan)	 Globe valve
 Hose angle	 Globe valve, (motor operated)
	 Hose valve, gate
	 Hose valve, globe
	 Lock shield valve
	 Quick opening valve
	 Safety valve

Pipe Fitting Symbolology (continued)

FITTINGS & VALVES	
	Bushing
	Cap
	Cross, reducing
	Cross, straight size
	Cross-over
	45° Elbow
	90° Elbow
	Elbow turned down
	Elbow turned up
	Base elbow
	Double-branch elbow
	Long-radius elbow
	Reducing elbow
	Side outlet elbow (outlet down)
	Side outlet elbow (outlet up)
	Orifice Plate
	Street elbow
	Joint, connecting pipe
	Expansion joint
	Lateral
	Pipe plug
	Concentric reducer
	Eccentric reducer
	Sleeve
	Tee, straight size
	Tee, outlet up
	Tee, outlet down
	Tee, double sweep
	Tee, reducing
	Tee, single sweep
	Tee, side outlet (outlet down)
	Tee, side outlet (outlet up)
NOTE: Pipe fittings and valves may be:	
	Flanged
	Screwed
	Bell & spigot
	Welded
	Soldered

Electrical Contacts and Symbols

SWITCHES				SELECTORS																					
Disconnect 	Circuit interrupter 	Circuit breakers w/ thermal OL 	Circuit breakers w/ magnetic OL 	2-position selector switch J K A1 A2 <table border="1"><tr><td></td><td>J</td><td>K</td></tr><tr><td>A1</td><td> </td><td></td></tr><tr><td>A2</td><td></td><td> </td></tr></table>			J	K	A1			A2													
	J	K																							
A1																									
A2																									
Pressure & vacuum switches N.O. N.C. 	Liquid level switches N.O. N.C. 	Temperature-actuated switches N.O. N.C. 	3-position selector switch J K L A1 A2 <table border="1"><tr><td></td><td>J</td><td>K</td><td>L</td></tr><tr><td>A1</td><td> </td><td></td><td></td></tr><tr><td>A2</td><td></td><td> </td><td> </td></tr></table>				J	K	L	A1				A2											
	J	K	L																						
A1																									
A2																									
Limit switches N.O. N.C. 	Speed (plugging) F F 	Anti-plug F 	2-position selector push button A B 1 2 3 4 <table border="1"><thead><tr><th>Selector position</th><th>Push button</th><th>Contacts 1-2</th><th>3-4</th></tr></thead><tbody><tr><td>A</td><td>Free</td><td> </td><td></td></tr><tr><td></td><td>Depressed</td><td></td><td> </td></tr><tr><td>B</td><td>Free</td><td></td><td> </td></tr><tr><td></td><td>Depressed</td><td></td><td> </td></tr></tbody></table> = contact closed			Selector position	Push button	Contacts 1-2	3-4	A	Free				Depressed			B	Free				Depressed		
Selector position	Push button	Contacts 1-2	3-4																						
A	Free																								
	Depressed																								
B	Free																								
	Depressed																								
Held closed 	Held open 	Flow switches N.O. N.C. 	Flow switches N.O. N.C. 	PUSH BUTTONS - MOMENTARY CONTACT																					
PUSH BUTTONS - MOMENTARY CONTACT				PUSH BUTTONS - MAINTAINED CONTACT																					
N.O. N.C. N.O. & N.C. (double circuit) Mushroom head Wobble stick Illuminated 	2 Single circuits 1 Double circuit 		PILOT LIGHTS																						
PILOT LIGHTS Non push-to-test Push-to-test (indicate color by letter)		INSTANT OPERATING CONTACTS w/ Blowout w/o Blowout N.O. N.C. N.O. N.C. 		TIMED CONTACTS Contact action retarded after coil is: Energized Deenergized N.O.T.C. N.C.T.O. N.O.T.O. N.C.T.C. 																					

Electrical Contacts and symbols

SWITCHES										
Disconnect		Circuit Interrupter		Circuit Breaker		Limit				
						Normally Open	Normally Closed	Neutral Position		
						Held Closed	Held Open			
Limit (continued)		Liquid Level		Vacuum and pressure		Temperature				
Maintained Position	Proximity Switch		Normally Open	Normally Closed	Normally Open	Normally Closed	Normally Open	Normally Closed		
	Closed	Open							Held Closed	Held Open
Flow (Air, Water, etc.)		Foot		Toggle	Cable Operated (Emerg.) Switch	Plugging		Non-Plug		
Normally Open	Normally Closed	Normally Open	Normally Closed				F	F	F	
Held Closed	Held Open					R	R	R		
Plugging with Lock-Out Coil	Selector			Rotary Selector						
	2-Position		3-Position		†Non-Bridging Contacts		†Bridging Contacts			
				or		or				
†Total Contacts to Suit Needs										














Electrical Contacts and Symbols



































Thermocouple Switch			Pushbuttons				Connections, etc.		
			Single Circuit	Double Circuit		Maintained Contact	Conductors		
			Normally Open	Mushroom Head	Normally Closed		Not Connected	Connected	
Connections, etc. (cont'd).			Contacts				Relay, etc.		
Ground	Chassis or Frame Not Necessarily Grounded	Plug and Recp.	Time Delay After Coil Energized				Normally Open	Normally Closed	Thermal Over-Load
			Normally Open	Normally Closed	Normally Open	Normally Closed			

Electronic Symbols

COMPONENTS	SWITCHES	PROTECTION & METERS	
Terminal board:	Single switch:	RUSC:	
Solid-state devices	Multiple position switch:	Breaker:	
PNP transistor:	Push button, normally closed:	Voltmeter:	
NPN transistor:	Push button, normally open:	Ammeter:	
Diode:	Push button, two-position:	Ohmmeter:	
Light-emitting diode:		Wattmeter:	
Zener diode:		A/C source or oscillator:	
Rectifier		ABBREVIATIONS AND LABELS	
Rectifier (full wave):		Volts: V	Transistors: O
Silicone-controlled rectifier (SCR):		Amperes: A	Capacitors: C
Amplifier:		Resistance: Ω	Resistors: R
		Capacitance: f (farads)	Inductors: L
		Potentiometer: pot	Diodes: CR
		Kilo (x 1,000): k	Milli (+1,000): m
		Mega (k10 ⁵): M	Micro (+10 ⁵): m
		Capacitor	Polarized Capacitor

PLC and Motor Control Symbols

PROTECTION DEVICES	OUTPUT DEVICES
 Fuse	 Light indicator
 Fuse	 Motor
 Overload	 DC motor armature
 Overload thermal	 3-phase motor
 Overload magnetic	 Heater
 Ladder logic overload	 LED indicator
	 Solenoid

SWITCHES & CONTACTS	TRANSFORMERS
 2-Position single-throw	 Coil
 2-Position double-throw	 Air core transformer
 Rotary, multiposition	 Iron core transformer
 2-Pole single-throw (dashed lines indicate contacts mechanically not electrically connected)	 Variable transformer
 2-Pole double-throw	 Auto transformer
 Manual toggle switch	 Single-phase power 1 line drawing
 (NO) Push button switch	 3-Phase delta transformer
 (NO) Manual foot switch	 Current transformer
 (NC) Limit switch	 Potential transformer
 (NO) Limit switch	
 (NC) Held open limit switch	
 (NO) Held closed limit switch	
 Paddle flow switch	
 Float switch	
 Pressure or vacuum switch	
 Time-delay switch	
 Temperature switch	
 Contacts (NO)	
 Contacts (NC)	
	COILS AND RELAYS
	 Motor starter coil
	 Forward or fast starter coil
	 Reverse starter coil
	 Slow starter coil
	 Control relay
	 Time delay relay
	NOTE: Various letter abbreviations may appear in the circles above.

ANSI and IEC Color Codes for Thermocouple Wire and Connectors

ANSI Code Connector Color	ANSI 96.1 Color Coding				Alloy Combination		Comments Environment Bare Wire	Maximum T/C Grade Temp Range	EMF (mV) Over Max Temp Range	IEC 584-3 Color Coding				IEC Code Connector Color	
	Thermocouple Grade		Extension Grade		Positive (+) Lead	Negative (-) Lead				Thermocouple Grade	Intrinsically Safe	Thermocouple Grade			Thermocouple Grade
	Positive (+)	Negative (-)	Positive (+)	Negative (-)								Positive (+)	Negative (-)		
J Black	White	Red	White	Red	Constantan Copper-Nickel Cu-Ni	Iron Fe (Magnetic)	Reducing, Vacuum, Inert, Limited Use in High Temps. Not Recommended in Low Temps	-210 to 1200° C -346 to 2193° F	-8.095 to 69.553	Black	White	Black	White	J Black	
K Yellow	Yellow	Red	Yellow	Red	Alomaga® Nickel-Aluminum Ni-Al (Magnetic)	Chromega® Nickel-Chromium Ni-Cr	Clean Oxidizing, Inert. Limited Use in Vacuum or Reducing, Wide Temp Range, Most Popular Calibration	-270 to 1372° C -454 to 2501° F	-6.458 to 54.886	Green	White	Green	White	K Green	
T Blue	Blue	Red	Blue	Red	Constantan Copper-Nickel Cu-Ni	Copper Cu	Mild Oxidizing. Reducing Vacuum or Inert. Good Where Moisture is Present. Low Temp and Cryogenic Applications	-270 to 400° C -454 to 752° F	-6.258 to 20.872	Brown	White	Brown	White	T Brown	
E Purple	Purple	Red	Purple	Red	Constantan Copper-Nickel Cu-Ni	Chromega® Nickel-Chromium Ni-Cr	Oxidizing or Inert. Limited Use in Vacuum or Reducing. Highest EMF Change per Degree	-270 to 1000° C -454 to 1852° F	-9.835 to 76.373	Purple	White	Purple	White	E Purple	
N Orange	Orange	Red	Orange	Red	Omega-P® Ni-Cr-Si	Nicrosil Ni-Cr-Si	Alternative to Type K More Stable at High Temps	-270 to 1300° C -450 to 2372° F	-4.345 to 47.513	Pink	White	Pink	White	N Pink	
R Green	None Established	Red	Black	Red	Platinum Pt	Platinum 13% Rhodium Pt-13% Rh	Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature	-50 to 1768° C -58 to 3214° F	-0.226 to 21.101	Orange	White	Orange	White	R Orange	
S Green	None Established	Red	Black	Red	Platinum Pt	Platinum 10% Rhodium Pt-10% Rh	Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature	-50 to 1768° C -58 to 3214° F	-0.236 to 18.693	Orange	White	Orange	White	S Orange	
U Green	None Established	Red	Blue	Red	Copper-Low Nickel Cu-Ni	Copper Cu	Extension Grade Connecting Wire for R & S/T/Cs. Also Known as RX & SX Extension Wire			Orange	White	Orange	White	U Orange	
B Gray	None Established	Red	Gray	Red	Platinum 6% Rhodium Pt-6% Rh	Platinum 30% Rhodium Pt-30% Rh	Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature. Common Use in Glass Industry	0 to 1820° C 32 to 3308° F	0 to 13.820	Gray	White	Gray	White	B Gray	

ANSI and IEC Color Codes for Thermocouple Wire and Connectors

Continued

ANSI Code Connector Color	ANSI 96.1 Color Coding				Alloy Combination		Comments Environment Bare Wire	Maximum T/C Grade Temp Range	EMF (mV) Over Max Temp Range	IEC 584-3 Color Coding			IEC Code Connector Color		
	Thermocouple Grade		Extension Grade		Positive (+) Lead	Negative (-) Lead				Thermocouple Grade	Intrinsically Safe	Thermocouple Grade		Positive (+)	Negative (-)
	Positive (+)	Negative (-)	Positive (+)	Negative (-)											
	Positive (+)	Negative (-)	Positive (+)	Negative (-)	Positive (+)	Negative (-)				Positive (+)	Negative (-)				
G (W) Red	None Established		Purple	Blue	Tungsten W	Tungsten 26% Rhenium W-26% Re	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C (750°F) Not for Oxidizing Atmosphere	0 to 38.564	0 to 2320° C 32 to 4208° F	No Standard Use ANSI Color Code		G (W) White			
C (W5) Red	None Established		White	Red	Tungsten 5% Rhenium W-5% Re	Tungsten 26% Rhenium W-26% Re	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C (750°F) Not for Oxidizing Atmosphere	0 to 37.066	0 to 2320° C 32 to 4208° F	No Standard Use ANSI Color Code		C (W5) White			
D (W3) Red	None Established		White	Red	Tungsten 3% Rhenium W-3% Re	Tungsten 25% Rhenium W-25% Re	Vacuum, Inert, Hydrogen. Beware of Embrittlement. Not Practical Below 399°C (750°F) Not for Oxidizing Atmosphere	0 to 39.506	0 to 2320° C 32 to 4208° F	No Standard Use ANSI Color Code		D (W3) White			

Resistor Color Codes

Color	Digit 1 st & 2 nd Bands	Multiplier 3 rd Band	Tolerance 4 th Band
Black	0	1	
Brown	1	10	+/- 1%
Red	2	100	+/- 2%
Orange	3	1K	
Yellow	4	10K	
Green	5	100K	+/- 0.5%
Blue	6	1M	+/- 0.25%
Violet	7	10M	+/- 0.01%
Gray	8	100M	
White	9	0.1	
Gold		0.01	+/- 5%
Silver			+/- 10%
None			+/- 20%

Common Specific Gravity Constants

Liquids	Gravity Number	Gases	Gravity Number
Water	1.00	Air	1.00
Mercury	13.6	Hydrogen	0.06
Alcohol	0.79	Nitrogen	0.96
Gasoline	0.67	Oxygen	1.10

Temperature Conversion Formulas

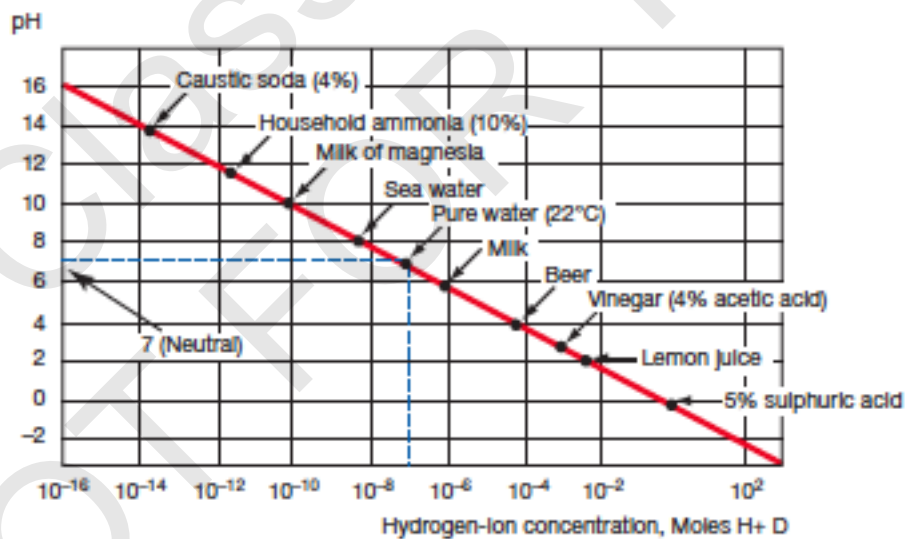
$$C = \frac{5}{9} \times (F - 32)$$

$$F = \frac{9}{5} \times C + 32$$

$$K = C + 273.15$$

$$R = F + 459.67$$

pH level vs. Hydrogen-Ion Concentration



Pressure Conversion Table

Multiply Number Of

by	Atmos	Bars	Dynes/ Cm ²	in Hg (0°C)	in H ₂ O (4°C)	K grams/ meter ²	lb/in ² PSI	lb/ft ²	mm Hg Torr	Microns	Pascals
Atmos	1.0	9.869233 10 ⁻¹	9.869233 10 ⁻⁷	3.342073 10 ⁻²	2.4583 10 ⁻³	9.6783 10 ⁻⁵	6.8046 10 ⁻²	4.72543 10 ⁻⁴	1.3163 10 ⁻³	1.3163 10 ⁻⁶	9.8693 10 ⁻⁶
Bars	1.01325	1.0	3.0 10 ⁻⁶	3.38643 10 ⁻²	2.4913 10 ⁻³	9.80673 10 ⁻⁵	6.89483 10 ⁻²	4.7883 10 ⁻⁴	1.3333 10 ⁻³	1.3333 10 ⁻⁶	3.0 10 ⁻⁵
Dynes/ Cm ²	1.013253 10 ⁶	1.0 10 ⁶	1.0	3.3863 10 ⁴	2.4913 10 ³	9.8967 10 ¹	6.89483 10 ⁴	4.788 10 ²	1.3333 10 ³	1.3333	1.0 10 ¹
in Hg (0°C)	2.99213 10 ¹	2.953 10 ¹	2.9533 10 ⁻⁵	1.0	7.3553 10 ⁻²	2.8963 10 ⁻³	2.036	1.4139 10 ⁻²	3.9373 10 ⁻²	3.9373 10 ⁻⁵	2.9533 10 ⁻⁴
in H ₂ O (4°C)	4.068 10 ²	4.0148 10 ²	4.01483 10 ⁻⁴	1.36 10 ¹	1.0	3.9373 10 ⁻²	2.768 10 ¹	1.922 10 ⁻¹	5.354 10 ⁻¹	5.3543 10 ⁻⁴	4.0143 10 ⁻³
K grams/ meter ²	1.03323 10 ⁴	1.01973 10 ⁴	1.01973 10 ⁻²	3.453 10 ²	2.54 10 ¹	1.0	7.03063 10 ²	4.882	1.359 10 ¹	1.3593 10 ⁻²	1.1093 10 ⁻¹
lb/in ² PSI	1.46956 10 ¹	1.4504 10 ¹	1.45043 10 ⁻⁵	4.912 10 ⁻¹	3.61263 10 ⁻²	1.4233 10 ⁻³	1.0	6.94443 10 ⁻³	1.9343 10 ⁻²	1.9343 10 ⁻⁵	1.4503 10 ⁻⁴
lb/ft ²	2.11622 10 ³	2.0885 10 ³	2.0885 10 ⁻³	7.0726 10 ¹	5.202	2.048 10 ⁻¹	1.44 10 ²	1.0	2.7844	2.78443 10 ⁻³	2.0893 10 ⁻²
mm Hg Torr	7.60 10 ²	7.5006 10 ²	7.50063 10 ⁻⁴	2.54 10 ¹	1.868	7.35583 10 ⁻²	5.1715 10 ¹	3.5913 10 ⁻¹	1.0	3.0 10 ⁻³	7.5023 10 ⁻³
Microns	7.603 10 ⁶	7.50063 10 ⁵	7.5006 10 ⁻¹	2.543 10 ⁴	1.8683 10 ³	7.3558 10 ¹	5.17153 10 ⁴	3.591 10 ²	3.0 10 ³	1.0	7.502
Pascals	1.013253 10 ⁵	3.0 10 ⁵	3.0 10 ⁻¹	3.3863 10 ³	2.4913 10 ²	9.8067	6.89483 10 ³	4.7883 10 ¹	1.3333 10 ²	1.3333 10 ⁻¹	1.0

To Obtain

General Conversion Factors

To Obtain	Multiply	By
Atmospheres	in HG@32°F	0.033421
BTU	Watts-hours	3.412
BTU	KWh	.3412
Centimeters	inches	2.54°
Cm of HG @ 0° C	Atmospheres	76.0
Cm of HG @ 0° C	Grams/sq. cm	0.07356
Cm of HG @ 0° C	Lb/sq in.	5.1715
Cm of HG @ 0° C	Lb/sq ft	0.035913
Cm/(sec)(sec)	Gravity	980.665
Centipoises	Centistokes	Density
Centistokes	Centipoises	1/density
Cu cm	Cu ft	28,317.0
Cu cm	Cu in.	16-387
Cu cm	Gal (USA, liq.)	3785.43
Cu cm	Liters	1000.03
Cu cm	Quarts (USA, liq.)	946.358
Cu cm/sec	Cu ft/min	472.0
Cu ft	Cu meters	35.314
Cu ft	Gal (USA, liq.)	0.13368
Cu ft	Liters	0.03532
Cu ft/min	Cu meters/sec	2118.9
Cu ft/min	Gal (USA, liq.)/sec	8.0192
Cu ft/sec	Gal (USA, liq.)/min	0.0022280
Cu ft/sec	Liters/min	0.0005886

General Conversion Factors (continued)

To Obtain	Multiply	By
Cu in.	Cu centimeters	0.061023
Cu in.	Gal (USA, liq.)	231.0
Cu in.	Liters	61.03
Cu meters	Gal (USA, liq.)	0.0037854
Cu meters	Liters	0.001000028
Cu meters/hr	Gal/min	0.22712
Cu meters/kg	Cu ft/lb	0.062428
Cu meters/min	Cu ft/min	0.02832
Cu meters/sec	Gal/min	0.000063088
Feet	Meters	3.281
Ft/min	Cm/Sec	1.9685
Ft/sec	Meters/sec	3.2808
Ft/(sec)(sec)	Gravity (sea level)	32.174
Ft/(sec)(sec)	Meters/(sec)(sec)	3.2808
Gal (Imperial, liq.)	Gal (USA, liq.)	0.83268
Gal (USA, liq.)	Barrels (Petroleum, USA)	42.0
Gal (USA, liq.)	Cu ft	7.4805
Gal (USA, liq.)	Cu meters	264.173
Gal (USA, liq.)	Cu yards	202.2
Gal (USA, liq.)	Gal (Imperial, liq.)	1.2010
Gal (USA, liq.)	Liters	0.2642
Gal (USA, liq.)/min	Cu ft/sec	448.83
Gal (USA, liq.)/min	Cu meters/hr	4.4029
Gal (USA, liq.)/sec	Liters/min	0.0044028
Grams	Pounds (a voir.)	453.5924

Metric Prefixes

Prefix	Symbol	10^n	Decimal Equivalent	Name
yotta	Y	10^{24}	1 000 000 000 000 000 000 000 000	septillion
zetta	Z	10^{21}	1 000 000 000 000 000 000 000	sextillion
exa	E	10^{18}	1 000 000 000 000 000 000	quintillion
peta	P	10^{15}	1 000 000 000 000 000	quadrillion
tera	T	10^{12}	1 000 000 000 000	trillion
giga	G	10^9	1 000 000 000	billion
mega	M	10^6	1 000 000	million
kilo	k	10^3	1 000	thousand
hecto	h	10^2	100	hundred
deca	da	10^1	10	ten
		10^0	1	one
deci	da	10^{-1}	0.1	tenth
centi	c	10^{-2}	0.01	hundredth
milli	m	10^{-3}	0.001	thousandth
micro	μ	10^{-6}	0.000 001	millionth
nano	n	10^{-9}	0.000 000 001	billionth
pico	p	10^{-12}	0.000 000 000 001	trillionth
femto	f	10^{-15}	0.000 000 000 000 001	quadrillionth
atto	a	10^{-18}	0.000 000 000 000 000 001	quintillionth
zepto	z	10^{-21}	0.000 000 000 000 000 000 001	sextillionth
yocto	y	10^{-24}	0.000 000 000 000 000 000 000 001	septillionth

Example: kiloamp (kA) = 1×10^3 amps = 1000 amps

milliamp (mA) = 1×10^{-3} amps = 0.001 amp