MAK 101 Makine Mühendisliğine Giriş

Birim Sistemleri

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International System of Units (SI)

TABLE 2.1
Base Units in the SI

Quantity	SI Base Unit	Abbreviation
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Temperature	Kelvin	K
Amount of substance	mole	mol
Light intensity	candela	cd

TABLE 2.2
Certain Derived Units in the SI

Quantity	SI Derived Unit	Abbreviation	Definition
Length	micrometer or micron	μm	$1\ \mu m = 10^{-6}$ m
Volume	liter	L	$1\ L = 0.001\ m^3$
Force	newton	N	$1\ N = 1\ (kg \cdot m)/s^2$
Torque, or moment of a force	newton-meter	N·m	—
Pressure or stress	pascal	Pa	$1\ Pa = 1\ N/m^2$
Energy, work, or heat	joule	J	$1\ J = 1\ N \cdot m$
Power	watt	W	$1\ W = 1\ J/s$
Temperature	degree Celsius	°C	$°C = K - 273.15$

Although a change in temperature of 1 Kelvin equals a change of 1 degree Celsius, numerical values are converted using the formula.

TABLE 2.3
Order-of-Magnitude Prefixes in the SI

Name	Symbol	Multiplicative Factor
tera	T	$1,000,000,000,000 = 10^{12}$
giga	G	$1,000,000,000 = 10^{9}$
mega	M	$1,000,000 = 10^{6}$
kilo	k	$1000 = 10^{3}$
hecto	h	$100 = 10^{2}$
deca	da	$10 = 10^{1}$
deci	d	$0.1 = 10^{-1}$
centi	c	$0.01 = 10^{-2}$
milli	m	$0.001 = 10^{-3}$
micro	μ	$0.000,001 = 10^{-6}$
nano	n	$0.000,000,001 = 10^{-9}$
pico	p	$0.000,000,000,001 = 10^{-12}$

United States Cusutomary System of Units (USCS)

TABLE 2.4
Base Units in the USCS

Quantity	USCS Base Unit	Abbreviation
Length	foot	ft
Force	pound	lb
Time	second	s
Electric current	ampere	A
Temperature	degree Rankine	°R
Amount of substance	mole	mol
Light intensity	candela	cd

TABLE 2.5
Certain Derived Units in the USCS

Quantity	Derived Unit	Abbreviation	Definition
Length	mil	mil	1 mil = 0.001 in.
	inch	in.	1 in. = 0.0833 ft
	mile	mi	1 mi = 5280 ft
Volume	gallon	gal	1 gal = 0.1337 ft^3
Mass	slug	slug	1 slug = 1 $(lb \cdot s^2)/ft$
	pound-mass	lbm	1 lbm = 3.1081 × 10^{-2} $(lb \cdot s^2)/ft$
Force	ounce	oz	1 oz = 0.0625 lb
	ton	ton	1 ton = 2000 lb
Torque, or moment of a force	foot-pound	ft · lb	—
Pressure or stress	pound/$inch^2$	psi	1 psi = 1 lb/in^2
Energy, work, or heat	foot-pound	ft · lb	—
	British thermal unit	Btu	1 Btu = 778.2 ft · lb
Power	horsepower	hp	1 hp = 550 (ft · lb)/s
Temperature	degree Fahrenheit	°F	°F = °R − 459.67

Although a change in temperature of 1 degree Rankine also equals a change of 1 degree Fahrenheit, numerical values are converted using the formula.

Quantity	USCS		SI
Length	1 in.	=	25.4 mm
	1 in.	=	0.0254 m
	1 ft	=	0.3048 m
	1 mi	=	1.609 km
	1 mm	=	3.9370 × 10^{-2} in.
	1 m	=	39.37 in.
	1 m	=	3.2808 ft
	1 km	=	0.6214 mi
Area	1 in^2	=	645.16 mm^2
	1 ft^2	=	9.2903 × 10^{-2} m^2
	1 mm^2	=	1.5500 × 10^{-3} in^2
	1 m^2	=	10.7639 ft^2
Volume	1 ft^3	=	2.832 × 10^{-2} m^3
	1 ft^3	=	28.32 L
	1 gal	=	3.7854 × 10^{-3} m^3
	1 gal	=	3.7854 L
	1 m^3	=	35.32 ft^3
	1 L	=	3.532 × 10^{-2} ft^3
	1 m^3	=	264.2 gal
	1 L	=	0.2642 gal
Mass	1 slug	=	14.5939 kg
	1 lbm	=	0.45359 kg
	1 kg	=	6.8522 × 10^{-2} slugs
	1 kg	=	2.2046 lbm
Force	1 lb	=	4.4482 N
	1 N	=	0.22481 lb
Pressure or stress	1 psi	=	6895 Pa
	1 psi	=	6.895 kPa
	1 Pa	=	1.450 × 10^{-4} psi
	1 kPa	=	0.1450 psi
Work, energy, or heat	1 ft · lb	=	1.356 J
	1 Btu	=	1055 J
	1 J	=	0.7376 ft · lb
	1 J	=	9.478 × 10^{-4} Btu
Power	1 (ft · lb)/s	=	1.356 W
	1 hp	=	0.7457 kW
	1 W	=	0.7376 (ft · lb)/s
	1 kW	=	1.341 hp

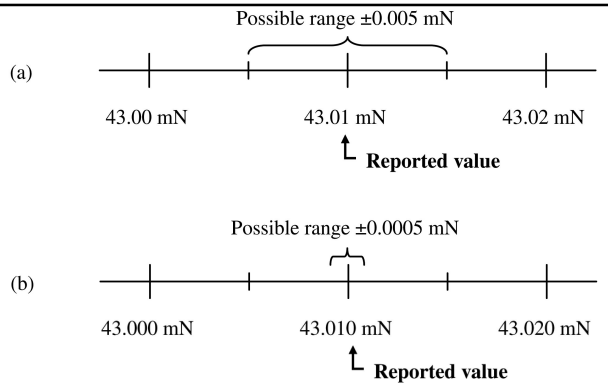

FIGURE 2.4
The precision of a numerical value for force depends on the number of significant digits that are reported. The actual physical value lies in a range centered around the reported value. (a) Two trailing digits. (b) Three trailing digits.

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FIGURE 2.6

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