1 Sistemas de unidades

- **Sistemas M.L.T. (Mass/Length/Time)**
  1. Sistema Internacional (S.I.)
  2. Sistema C.G.S.
- **Sistemas F.L.T. (Force/Length/Time)**
  1. Sistema Técnico (S.T.)

Grandeza	S.I.	C.G.S.	S.T.
Massa	kg	g	utm
Comprimento	m	cm	m
Tempo	s	s	s
Força	N	dyn	kgf

- **Força**

$$\boldsymbol{F} = m\,\boldsymbol{a} \tag{1}$$

No S.I.

$$[\,F\,] = \mathrm{kg}\,\frac{\mathrm{m}}{\mathrm{s}^2} = \mathrm{N} \tag{2}$$

No C.G.S.

$$[\,F\,] = \mathrm{g}\,\frac{\mathrm{cm}}{\mathrm{s}^2} = \mathrm{dyn\,(dina)} \tag{3}$$

- **Massa (unidade derivada)**

$$[\,m\,] = \left[\,\frac{F}{a}\,\right] = \frac{\mathrm{kgf}}{\mathrm{m/s}^2} = \frac{\mathrm{kgf}\cdot\mathrm{s}^2}{\mathrm{m}} \tag{4}$$

- **Energia**

$$E = F\,d \tag{5}$$

No S.I.

$$[\,E\,] = \mathrm{N}\cdot\mathrm{m} = \mathrm{J} \tag{6}$$

No C.G.S.

$$[\,E\,] = \mathrm{dyn}\cdot\mathrm{cm} = \mathrm{erg} \tag{7}$$

No S.T.

$$[\,E\,] = \mathrm{kgf}\cdot\mathrm{m} \tag{8}$$

- **Potência**

$$P = \frac{E}{t} \tag{9}$$

No S.I.

$$[\,P\,] = \frac{\mathrm{J}}{\mathrm{s}} = \mathrm{W} \tag{10}$$

No C.G.S.

$$[\,P\,] = \frac{\mathrm{erg}}{\mathrm{s}} \tag{11}$$

No S.T.

$$[\,P\,] = \frac{\mathrm{kgf}\cdot\mathrm{m}}{\mathrm{s}} \tag{12}$$

- **Pressão**

$$p = \frac{F}{A} \tag{13}$$

$$1\,\text{bar} = 10^6\,\text{baria} \tag{14}$$

No S.I.

$$[\,p\,] = \frac{\text{N}}{\text{m}^2} = \text{Pa} \tag{15}$$

No C.G.S.

$$[\,p\,] = \frac{\text{dyn}}{\text{cm}^2} = \text{baria} \tag{16}$$

No S.T.

$$[\,p\,] = \frac{\text{kgf}}{\text{m}^2} \tag{17}$$

1.1 Conversão de unidades

Exemplos

(a) $\text{L/min} \rightarrow \text{m}^3\text{/h}$

$$1\frac{\text{L}}{\text{min}} = \frac{10^{-3}}{1/60}\frac{\text{m}^3}{\text{h}} \tag{18}$$

$$= 0.06\,\frac{\text{m}^3}{\text{h}} \tag{19}$$

(b) $\text{m}^3\text{/ha} \rightarrow \text{L/m}^2$

$$1\,\text{ha} = 100\,\text{m} \times 100\,\text{m} = 10\,000\,\text{m}^2 \tag{20}$$

$$1\,\frac{\text{m}^3}{\text{ha}} = \frac{10^3}{10^4}\frac{\text{L}}{\text{m}^2} \tag{21}$$

$$= 0.1\,\frac{\text{L}}{\text{m}^2} \tag{22}$$

(c) $\text{kgf/cm}^2 \rightarrow \text{Pa}$

$$1\,\text{kgf} = 9.81\,\text{N} \tag{23}$$

$$1\,\frac{\text{kgf}}{\text{cm}^2} = \frac{9.81}{10^{-4}}\frac{\text{N}}{\text{m}^2} \tag{24}$$

$$= 98\,100\,\text{Pa} \tag{25}$$

1.2 Conversões notáveis

1. $1\,\text{in} = 25.4\,\text{mm}$
2. $1\,\text{ha} = 10\,000\,\text{m}^2$
3. $1\,\text{m}^3 = 1000\,\text{L}$
4. $1\,\text{kgf} = 9.81\,\text{N}$
5. $1\,\text{lbf} = 0.4536\,\text{kgf} = 4.448\,\text{N}$
6. $1\,\text{lbf/in}^2 = 1\,\text{psi}$ (pound force per inch)

7. $1\,\mathrm{bar} = 10^6\,\mathrm{baria} = 14.504\,\mathrm{psi} = 100\,\mathrm{kPa}$
8. $1\,\mathrm{atm} = 101.325\,\mathrm{kPa}$
9. $1\,\mathrm{cv} = 736\,\mathrm{W}$
10. $1\,\mathrm{hp} = 746\,\mathrm{W}$