

# 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**

$$\mathbf{F} = m \mathbf{a} \quad (1)$$

No S.I.

$$[F] = \text{kg} \frac{\text{m}}{\text{s}^2} = \text{N} \quad (2)$$

No C.G.S.

$$[F] = \text{g} \frac{\text{cm}}{\text{s}^2} = \text{dyn (dina)} \quad (3)$$

- **Massa (unidade derivada)**

$$[m] = \left[ \frac{F}{a} \right] = \frac{\text{kgf}}{\text{m/s}^2} = \frac{\text{kgf} \cdot \text{s}^2}{\text{m}} \quad (4)$$

- **Energia**

$$E = F d \quad (5)$$

No S.I.

$$[E] = \text{N} \cdot \text{m} = \text{J} \quad (6)$$

No C.G.S.

$$[E] = \text{dyn} \cdot \text{cm} = \text{erg} \quad (7)$$

No S.T.

$$[E] = \text{kgf} \cdot \text{m} \quad (8)$$

- **Potência**

$$P = \frac{E}{t} \quad (9)$$

No S.I.

$$[P] = \frac{\text{J}}{\text{s}} = \text{W} \quad (10)$$

No C.G.S.

$$[P] = \frac{\text{erg}}{\text{s}} \quad (11)$$

No S.T.

$$[P] = \frac{\text{kgf} \cdot \text{m}}{\text{s}} \quad (12)$$

- **Pressão**

$$p = \frac{F}{A} \quad (13)$$

$$1 \text{ bar} = 10^6 \text{ baria} \quad (14)$$

No S.I.

$$[p] = \frac{\text{N}}{\text{m}^2} = \text{Pa} \quad (15)$$

No C.G.S.

$$[p] = \frac{\text{dyn}}{\text{cm}^2} = \text{baria} \quad (16)$$

No S.T.

$$[p] = \frac{\text{kgf}}{\text{m}^2} \quad (17)$$

## 1.1 Conversão de unidades

### Exemplos

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

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

$$= 0.06 \frac{\text{m}^3}{\text{h}} \quad (19)$$

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

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

$$1 \frac{\text{m}^3}{\text{ha}} = \frac{10^3 \text{ L}}{10^4 \text{ m}^2} \quad (21)$$

$$= 0.1 \frac{\text{L}}{\text{m}^2} \quad (22)$$

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

$$1 \text{ kgf} = 9.81 \text{ N} \quad (23)$$

$$1 \frac{\text{kgf}}{\text{cm}^2} = \frac{9.81 \text{ N}}{10^{-4} \text{ m}^2} \quad (24)$$

$$= 98\,100 \text{ Pa} \quad (25)$$

## 1.2 Conversões notáveis

- 1 in = 25.4 mm

- 1 ha = 10 000 m<sup>2</sup>

- 1 m<sup>3</sup> = 1000 L

- 1 kgf = 9.81 N

- 1 lbf = 0.4536 kgf = 4.448 N

- 1 lbf/in<sup>2</sup> = 1 psi (pound force per inch)

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