Física I

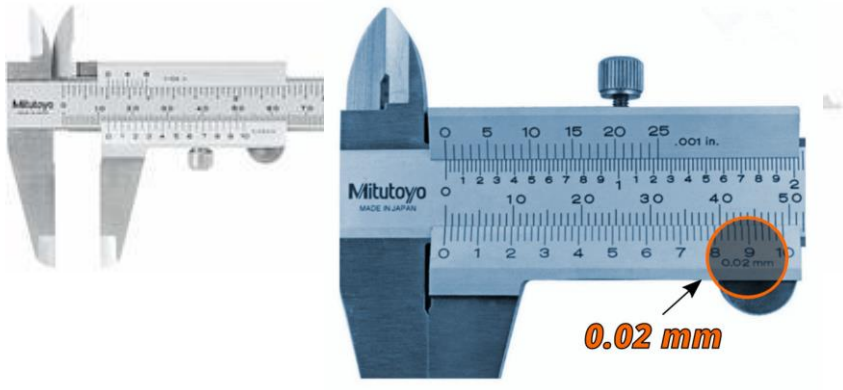
Laboratorio

Propagación de Errores

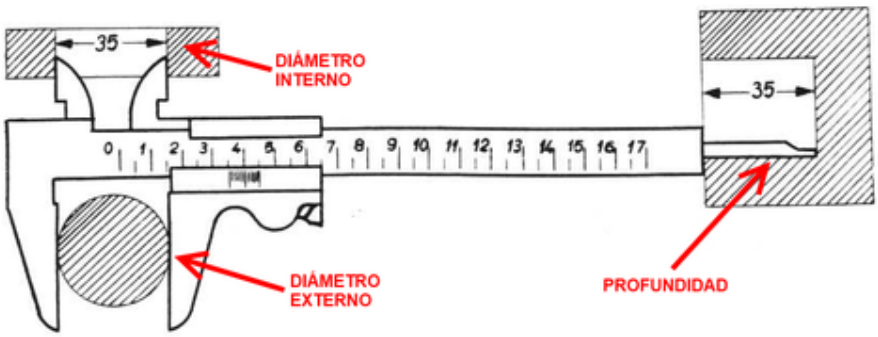
2020

Calibre o vernier

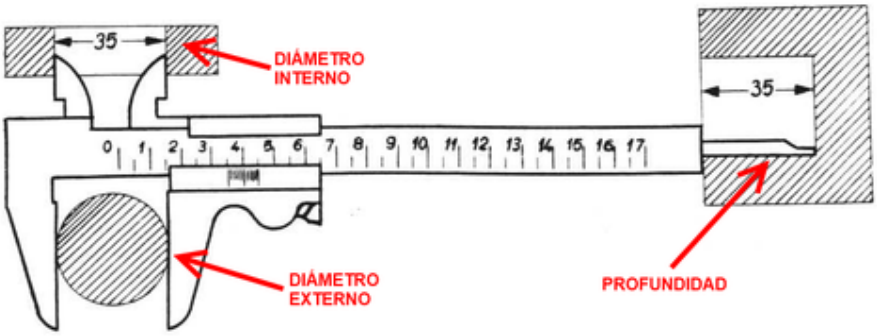
Calibre o vernier



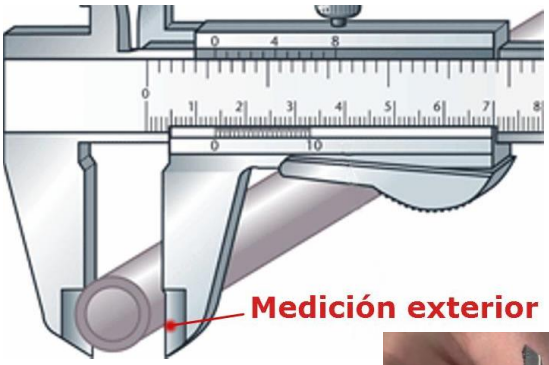
Calibre o vernier



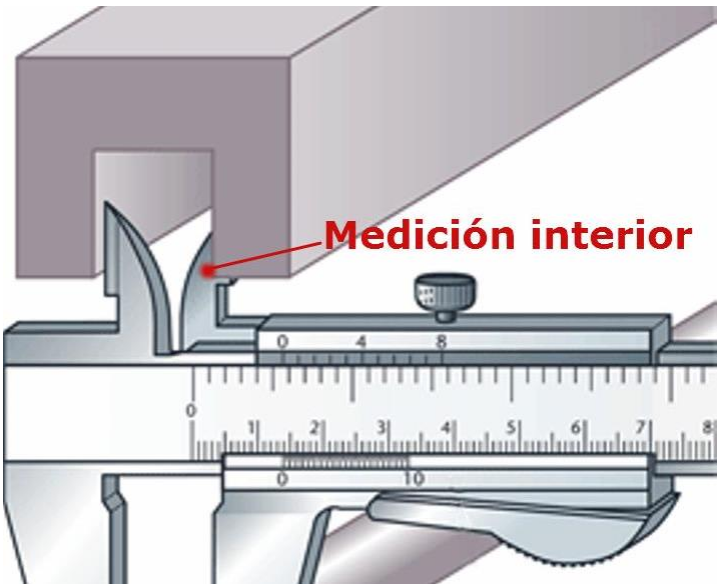
Calibre o vernier



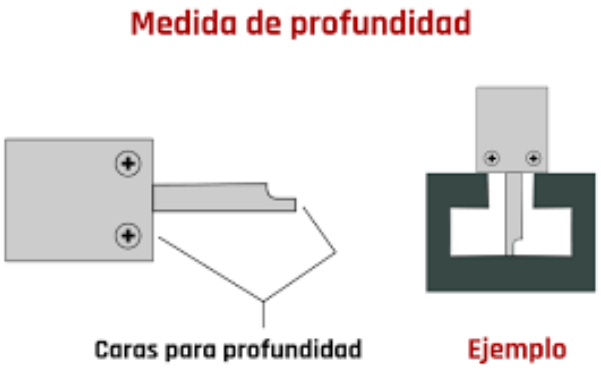
Calibre o vernier – Medición exterior



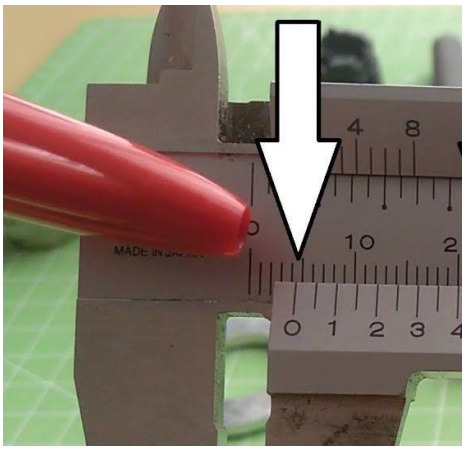
Calibre o vernier – Medición interior



Calibre o vernier – Medición de profundidad



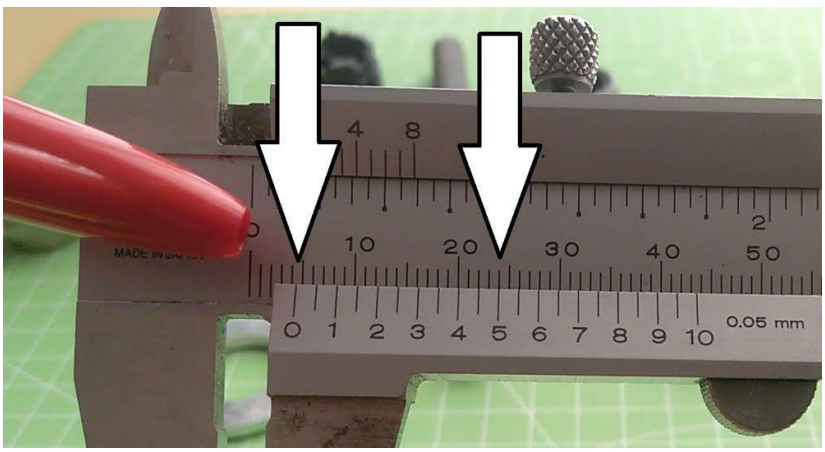
Calibre o vernier – lectura de la medida



Apreciación del instrumento: 0,05mm

4

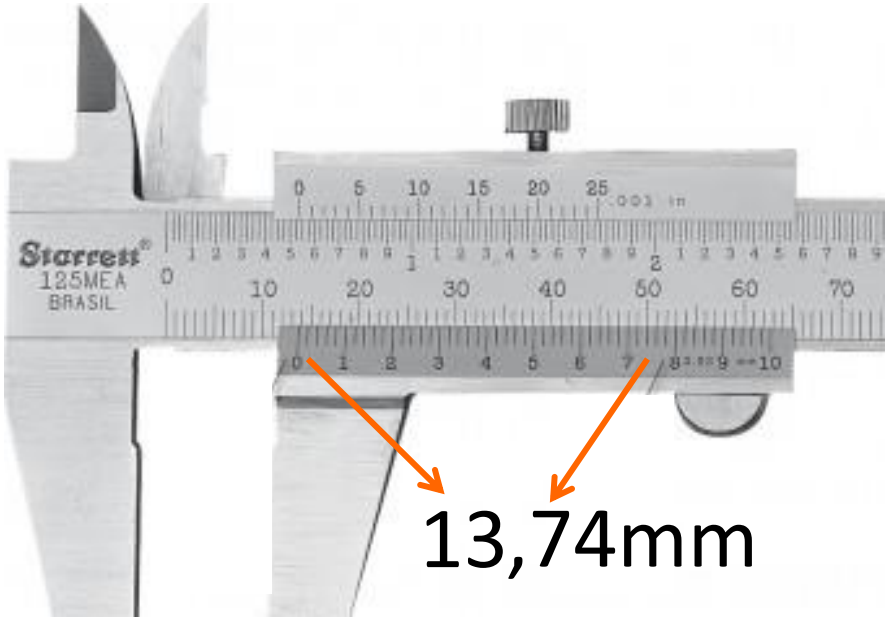
Calibre o vernier – lectura de la medida

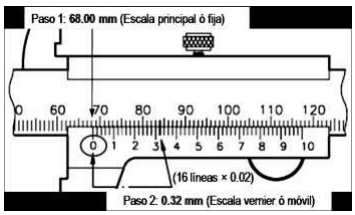


Apreciación del instrumento: 0,05mm

4,50mm

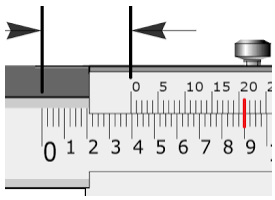
Calibre o vernier – lectura de la medida





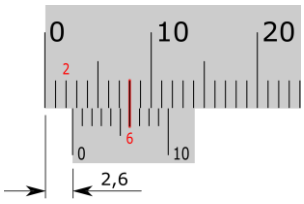
Apreciación: 0,02mm

68,32mm



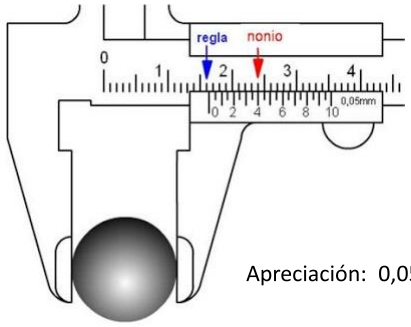
Apreciación: 0,01mm

3,75mm+0,21mm=3,96mm



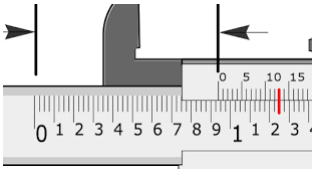
Apreciación: 0,01mm

2,06mm



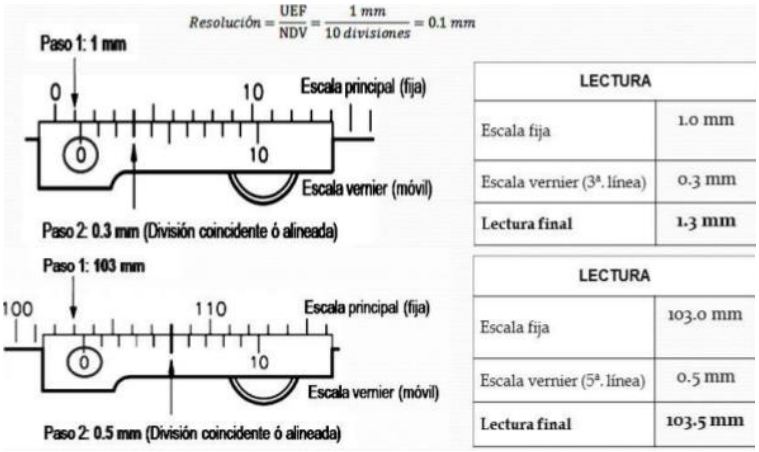
Apreciación: 0,05mm

16mm+0,40mm=16,40mm



Apreciación: 0,01mm

9,25mm+0,13mm=9,38mm

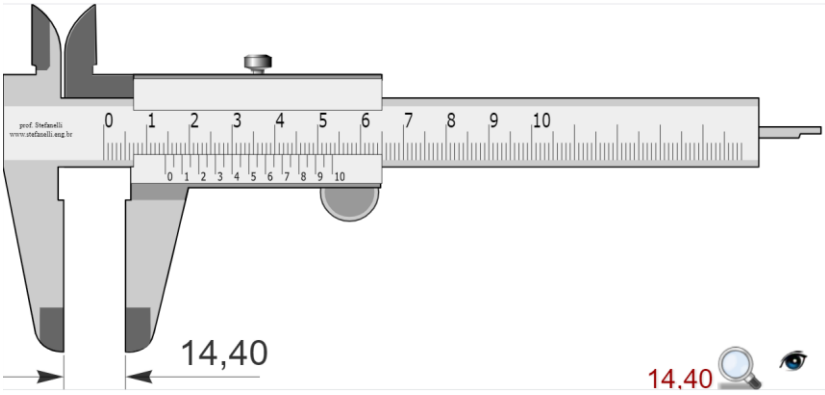


LECTURA	
Escala fija	1.0 mm
Escala vernier (3ª. línea)	0.3 mm
Lectura final	**1.3 mm**

LECTURA	
Escala fija	103.0 mm
Escala vernier (5ª. línea)	0.5 mm
Lectura final	**103.5 mm**

Calibre o vernier – lectura de la medida

- https://www.stefanelli.eng.br/es/calibre-virtual-simulador-milimetro-05/



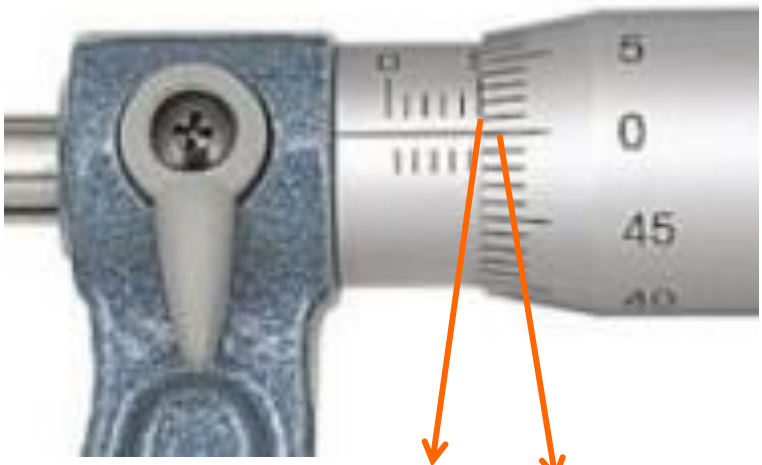
Palmer o tornillo micrométrico

Palmer o tornillo micrométrico

Apreciación: 0,01mm

Alcance: 25mm

Palmer o tornillo micrométrico - Lectura



Apreciación del instrumento: 0,01mm

5,00mm

Palmer o tornillo micrométrico - Lectura

12,5mm +0,40mm =12,90mm

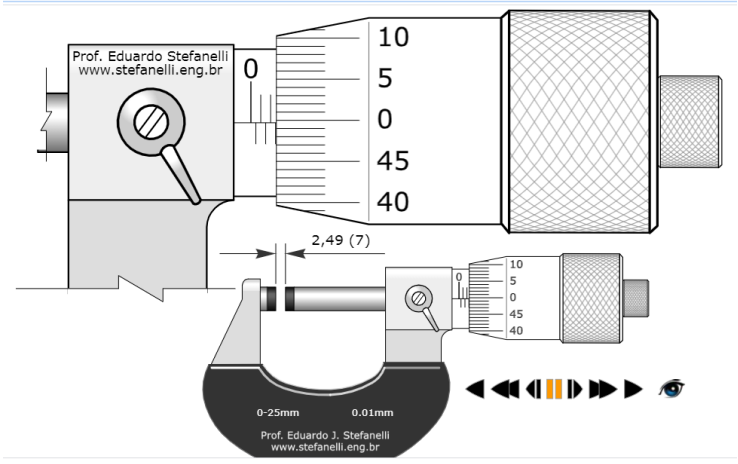
Palmer o tornillo micrométrico - Lectura

19,0mm +0,11mm =20,11mm

9,0mm +0,23mm =9,23mm

Palmer o tornillo micrométrico - Lectura

https://www.stefanelli.eng.br/es/micrometro-virtual-centesimas-milimetro-simulador/



EJERCICIO: propagación de errores

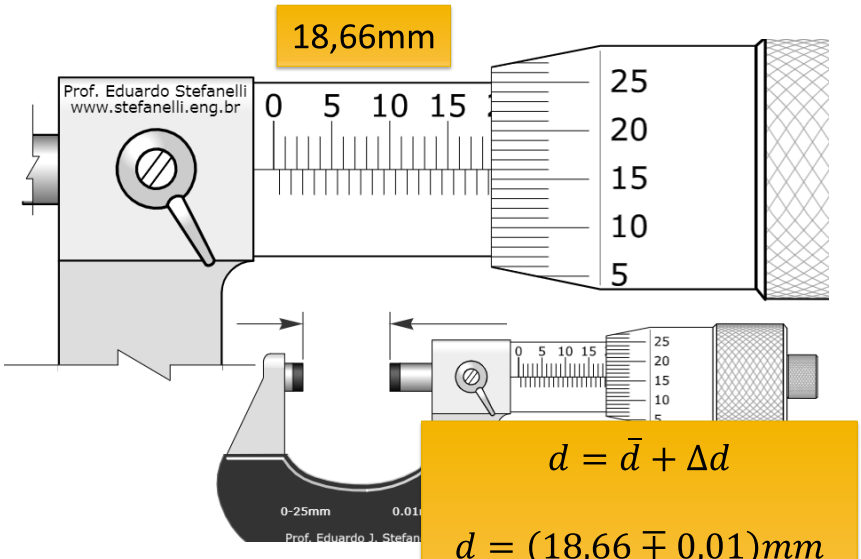
Con la medida del diámetro y la altura, calcule realizando la propagación de errores y exprese como valores acotados :

a) El perímetro de un rectángulo de altura igual a la del cilindro y base igual al diámetro del mismo (la vista del cilindro).

b) El área de ese rectángulo.

c) El volumen del cilindro.

Diámetro:



$$d = \bar{d} + \Delta d$$

$$d = (18{,}66 \mp 0{,}01)mm$$

Altura:

Nº	Lectura [mm] h_i	Valor más probable [mm] $\bar{h}$	Error aparente [mm] $h_i - \bar{h}$	Error aparente al cuadrado [mm^2] $(h_i - \bar{h})^2$	Diámetro [mm] h
1	86,25				Instrumento utilizado:
2	86,15				CALIBRE
3	86,05				Error de apreciación:
4	85,92				
5	85,96				Error absoluto:
6	86,20				
7	86,15				Error:
8	86,15				
9	86,00				Valor acotado:
10	85,88				
Σ					

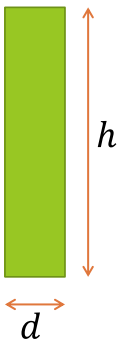
$$e = \sqrt{\frac{\sum (h_i - \bar{h})^2}{n(n-1)}}$$

- El mayor entre el error de apreciación y el error absoluto.

$$h = \bar{h} + \Delta h$$

Perímetro

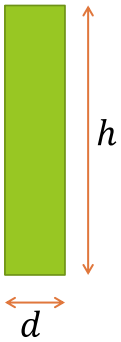
$$d = \bar{d} + \Delta d$$
$$h = \bar{h} + \Delta h$$



$$\bar{P} = 2\bar{d} + 2\bar{h} \qquad \Delta P = 2\Delta d + 2\,\Delta h$$

$$P = \bar{P} + \Delta P$$

Área



$$\bar{A} = \bar{d}.\bar{h}$$

$$d = \bar{d} + \Delta d$$
$$h = \bar{h} + \Delta h$$

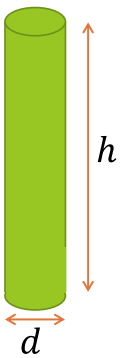
$$\varepsilon_A = \varepsilon_d + \varepsilon_h$$

$$\frac{\Delta A}{\bar{A}} = \frac{\Delta d}{\bar{d}} + \frac{\Delta h}{\bar{h}}$$

$$\Delta A = \bar{A}\left(\frac{\Delta d}{\bar{d}} + \frac{\Delta h}{\bar{h}}\right)$$

$$A = \bar{A} + \Delta A$$

Volumen



$$\bar{V} = \pi.\frac{\bar{d}^2}{4}.\bar{h}$$

$$d = \bar{d} + \Delta d$$
$$h = \bar{h} + \Delta h$$

$$\varepsilon_V = \varepsilon_\pi + 2\varepsilon_d + \varepsilon_h$$

$$\frac{\Delta V}{\bar{V}} = \frac{\Delta \pi}{\bar{\pi}} + 2\frac{\Delta d}{\bar{d}} + \frac{\Delta h}{\bar{h}}$$

$$\Delta V = \bar{V}\left(\frac{\Delta \pi}{\bar{\pi}} + 2\frac{\Delta d}{\bar{d}} + \frac{\Delta h}{\bar{h}}\right)$$

$$V = \bar{V} + \Delta V$$

Valores acotados (ejemplos)

$\bar{P} = 32{,}42cm$

$\Delta P = 0{,}1cm$

Entre $32{,}3cm$ y $32{,}5cm$

$$P = (32{,}4 \mp 0{,}1)cm$$

Valor más probable→ IGUAL ORDEN DECIMAL QUE EL ERROR

Errores → SÓLO UNA CIFRA SIGNIFICATIVA

Valores acotados (ejemplos)

$\bar{P} = 203{,}58cm$

$\Delta P = 0{,}61cm$

$$P = (203{,}6 \mp 0{,}6)cm$$

$\bar{A} = 1603{,}15cm^2$

$\Delta A = 2{,}23cm^2$

$$A = (1603 \mp 2)cm^2$$

$\bar{V} = 23518{,}079cm^3$

$\Delta V = 371{,}54cm^3$

$$V = (235 \mp 4)10^2cm^3$$