




This equipment has been designed for the study of the most relevant properties and phenomena in the field of fluid statics.

Applicable studies:


- Density Measurement
- Demonstration of Pascal's principle
- Study and demonstration of capillarity
- Viscosity coefficient calculations
- Measurement of pressure
- Calibration of pressure gauges
- Archimedes' principle
- Stability of floating bodies
- Pressure, potential and kinetic energy
- Hydrostatic forces on submerged surfaces
- Metacentric height
- Bernoulli's equation
- Surface tension

**FL-01.3-BANCO-HIDROSTÁTICO**


→ Accionamos la bomba mediante el interruptor (26).<sup>¶</sup>



→ Mediante una válvula de bola regulamos el caudal de agua sube al depósito.<sup>¶</sup>




→ Para insuflar presión en los manómetros utilizamos la bomba de aire (19). Conectamos ésta mediante los enchufes rápidos.<sup>¶</sup>



12<sup>¶</sup>


**FL-01.3-BANCO-HIDROSTÁTICO**

→ Utilizamos los enchufes rápidos de la parte superior de cada ramal para comunicarlos con el exterior, es decir conectando una hembra presionando sobre el macho el ramal está en contacto con la presión atmosférica.<sup>¶</sup>



Si queremos llenar los manómetros de agua, sin tener que desmontarlos, se puede realizar de una manera fácil siguiendo estos pasos.<sup>¶</sup>


→ Conectar una de las mangueras suministradas a la toma que hay en el conducto del manómetro inclinado y el otro extremo al distribuidor de presiones.<sup>¶</sup>




→ Comunicar con otra de las mangueras suministradas el distribuidor de presiones y los manómetros de columna de agua y/o diferencial, dependiendo de si queremos llenar uno o los dos.<sup>¶</sup>

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**FL-01.3-BANCO-HIDROSTÁTICO**



→ Colocar la válvula de 3 vías de manera que llegue agua al manómetro inclinado.<sup>¶</sup>



→ Regular con la válvula trasera o delantera el caudal para que no se desborde el manómetro inclinado.<sup>¶</sup>

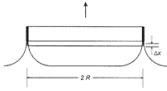


14<sup>¶</sup>

The user manual clearly shows and with a large number of images, the entire process to be followed to use the equipment.

**FL 01.3 BANCO HIDROSTÁTICO**

En nuestro caso, tal y como se muestra en la siguiente figura, la fuerza necesaria para levantar el anillo metálico será:



$$F = \frac{\Delta E}{\Delta x} \quad (2)$$

Siendo el área

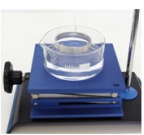
$$\Delta A = 4 * \pi * R * \Delta x \quad (3)$$

Sustituyendo las ecuaciones 2 y 3 en 1, tenemos la siguiente expresión:

$$\sigma = \frac{F}{4 * \pi * R}$$

**5.4.2. MÉTODO**


- Colocamos el recipiente cilíndrico con el líquido cuya tensión superficial queremos medir encima de la plataforma elevadora.



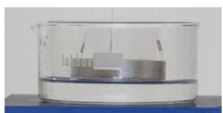
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**FL 01.3 BANCO HIDROSTÁTICO**

- Colgamos el dinamómetro (21) en el soporte y el anillo metálico en el dinamómetro tal y como se muestra en la fotografía.



- Sumergimos el anillo metálico en el líquido.
- A continuación descendemos lentamente la plataforma elevadora observando cómo va aumentando la fuerza indicada por el dinamómetro.
- Medimos la fuerza justo antes de que el anillo metálico se despegue.



- Anotamos los resultados obtenidos en la tabla siguiente.

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**FL 01.3 BANCO HIDROSTÁTICO**

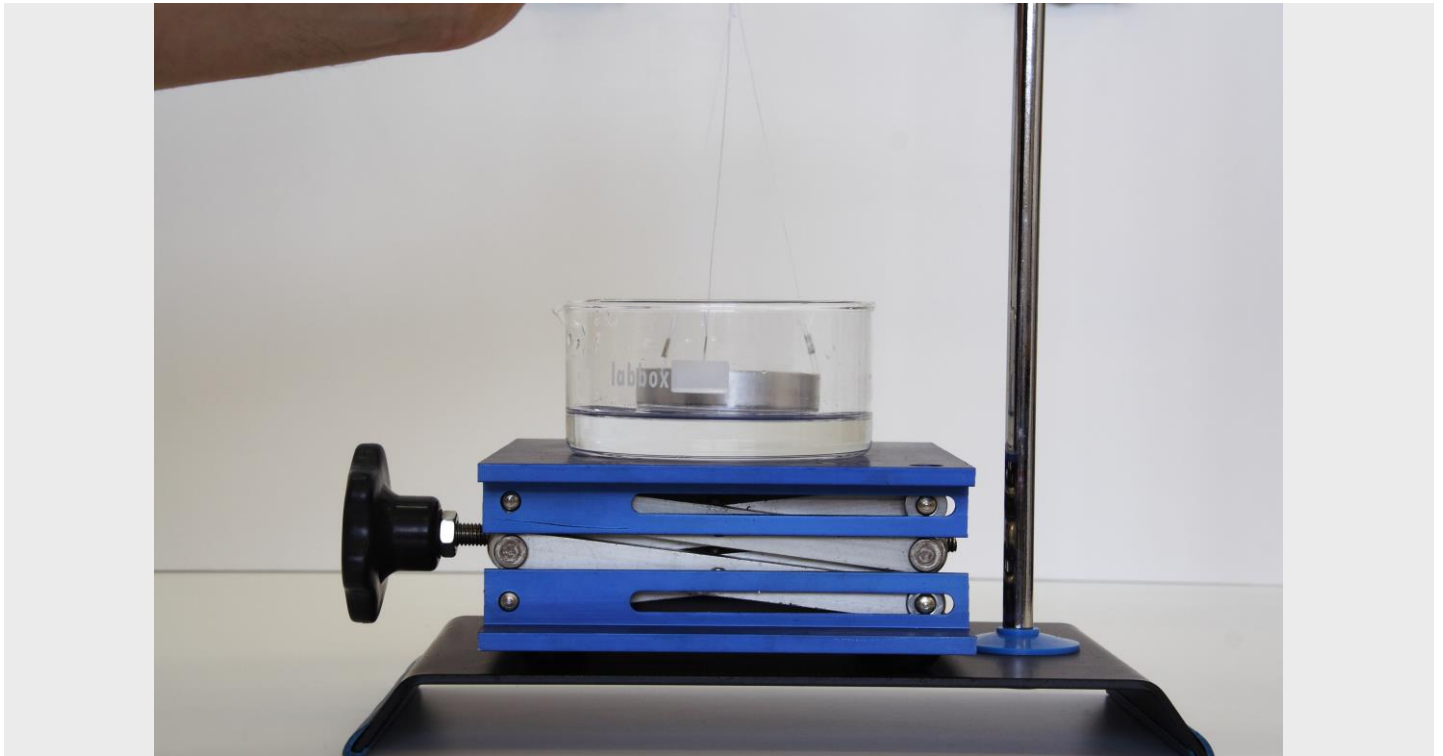
**5.4.3. LECTURAS Y RESULTADOS**

Diámetro anillo metálico = 60 mm

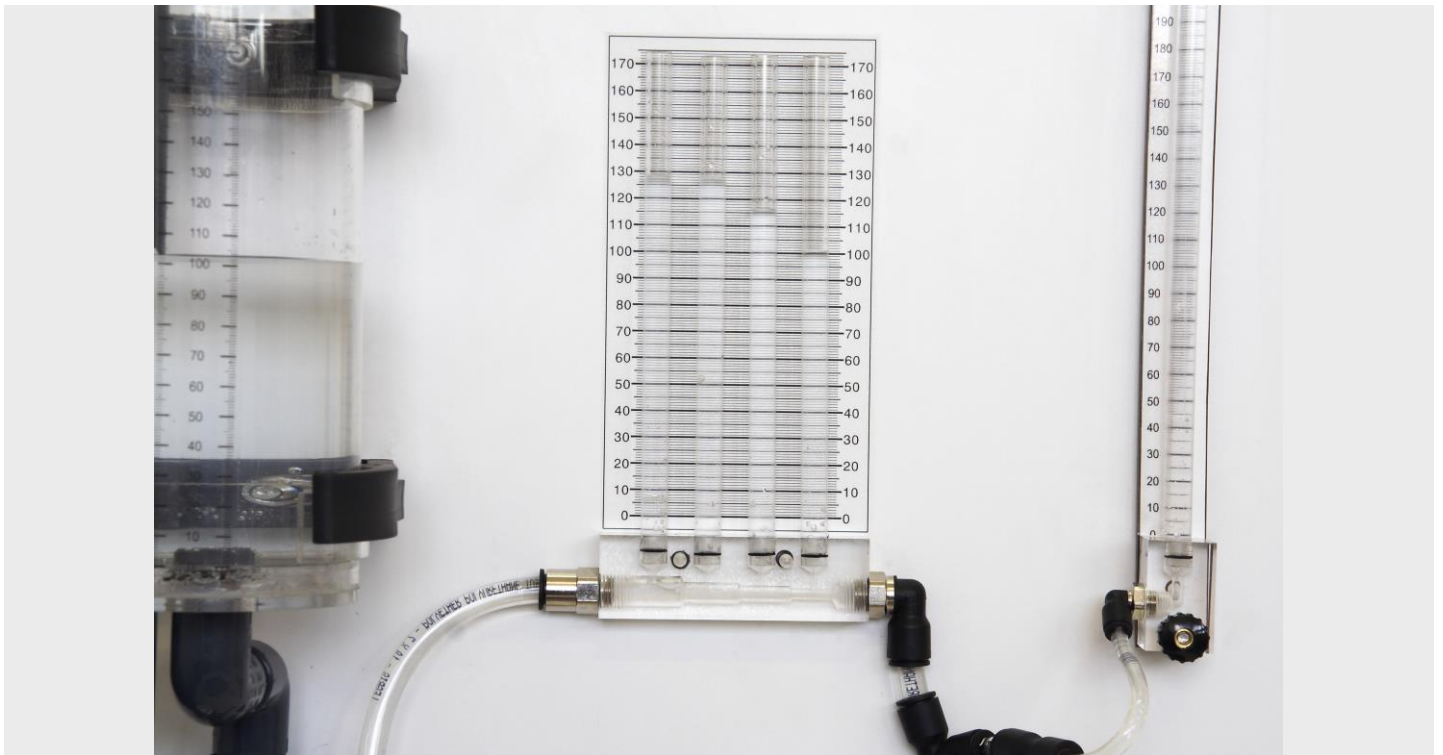
Fluido	Fuerza (N)	Tensión superficial $\sigma$ (N/m)

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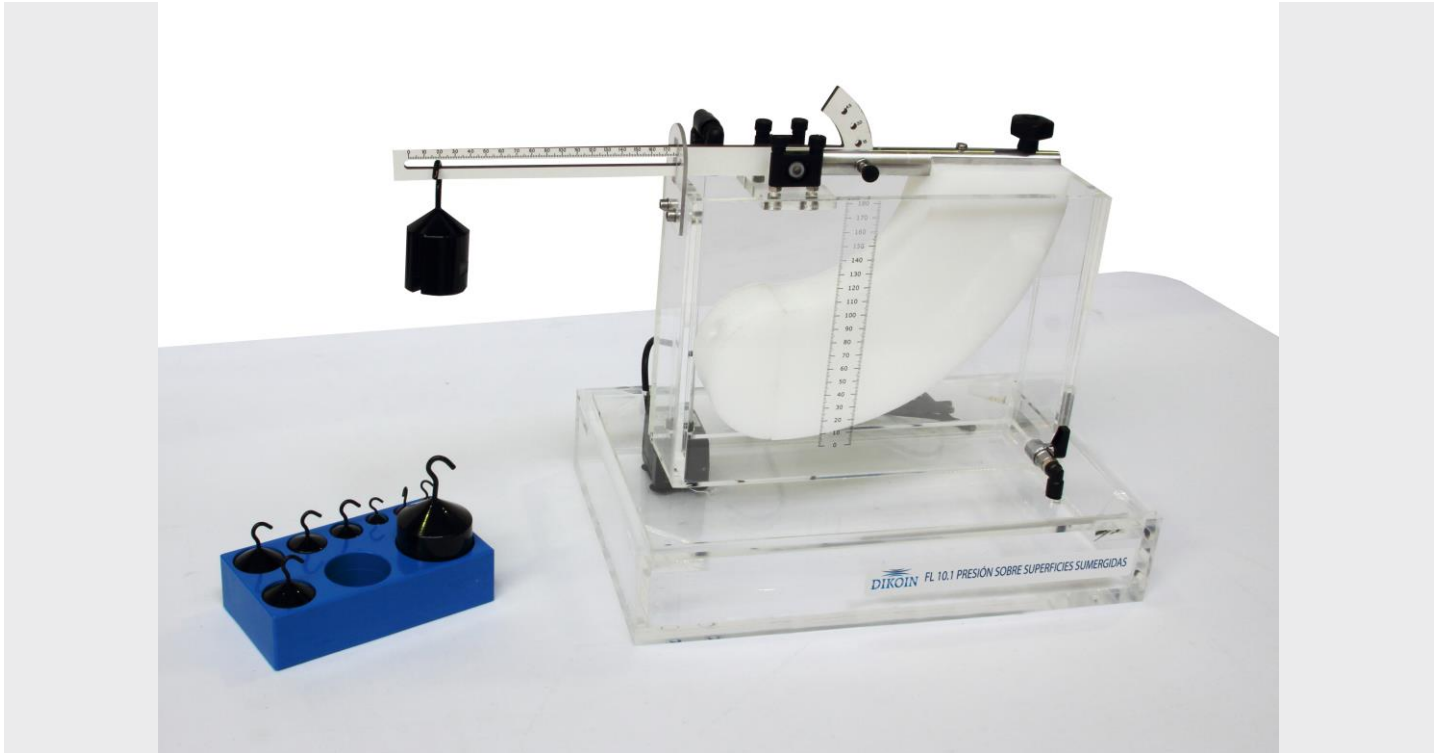
The practical manual shows and explains all the theoretical foundations, as well as the mathematical formulas used for the realization of all the experimentation.



Detail of the practice of surface tension.



Detail of the difference of pressures in functions of the passage section of the fluid.



Included Accessory: FL 10.1 - HYDROSTATIC PRESSURE ON SUBMERGED SURFACES

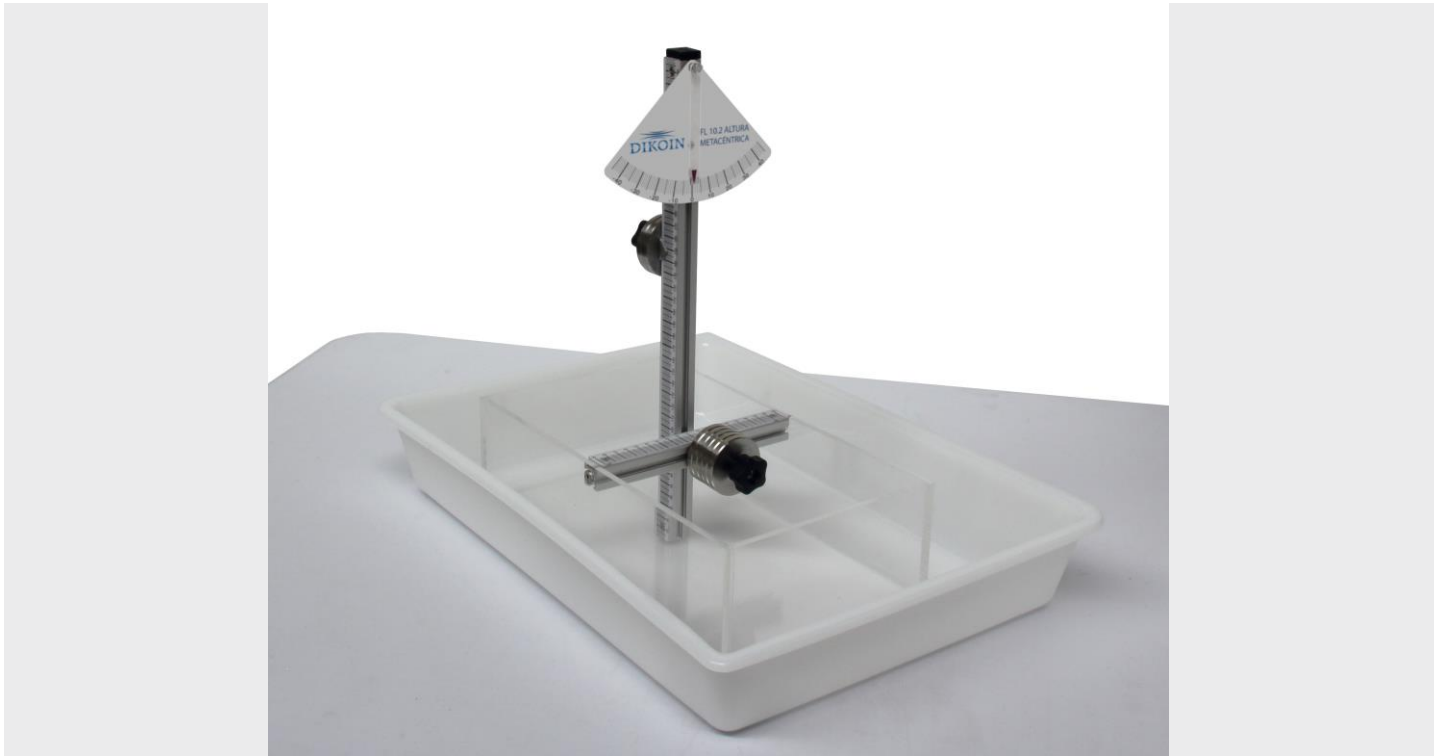
This equipment aims the study and determination of the pressure force acting on a submerged surface in a liquid.

It is a simple and completely autonomous equipment that can be located anywhere in the laboratory without any installation.

Liquids of different densities can be used to determine the influence of this on the exerted pressure force.

#### **HIGHLIGHTS**

- Independent operating equipment.
- Calculation of the pressure force exerted on both flat and curve surfaces.
- Possibility of varying the angle of the surface on which the study is made.
- It has a pump to recirculate the water, so it doesn't need any jar or element to fill the tank during the experiments.



Included Accessory: FL 10.2 - METACENTRIC HEIGHT

The principle of Archimedes says that: **"Every body submerged in a liquid experiences a vertical thrust and upward equal to the weight of the liquid dislodged"**.

With this equipment is intended to study and calculate the metacentric height of a floating body, which pretends to be a boat.

It is called **metacenter** to the point of intersection of the vertical axis of the boat or floating object, with the vertical drawn from the center of hull.

The **metacentric height** is the distance between the metacenter and the center of gravity of the floating body.

In the study of the equilibrium of a floating object, such as a boat, we can distinguish three cases, are the following:

- **Stable equilibrium:** If the metacenter is above the center of gravity of the body, it will remain in balance.
- **Unstable equilibrium:** If the metacenter is under the center of gravity of the body, the deviation of the line of force from the weight of the floating object with respect to the thrust of the fluid in which it floats form a torque, and therefore the deviation tends to increase further.
- **Neutral equilibrium:** If the metacenter coincides with the center of gravity of the body, the metacentric height will be equal to zero.

With this equipment, calculations can be studied and performed in different situations, so that both Archimedes' principle and the stability of a floating object will be clearly understood.

The equipment is prepared to be able to change the position of the center of gravity of the floating object, having calibrated rules to control the position of the weights, as well as the angle of inclination of the barge directly.



Included Accessory: FL 13.1 - MANOMETER CALIBRATION

The objective of this equipment is the study and calibration of manometers, as well as the visualization and understanding of its operation.

#### **HIGHLIGHTS**

- Completely autonomous equipment without water supply.
- Very didactic equipment because it has a transparent manometer.
- It has a cylinder with flywheel to introduce pressure in the circuit.
- Possibility of working in parallel with a digital manometer (Manometer not supplied).



**LEARNING OBJECTIVES**

With this equipment a lot of studies can be done in the following areas:

- Measurement of densities.
- Demonstration of Pascal`s law.
- Study and demonstration of the capillary.
- Determination of viscosity.
- Pressure measurement.
- Calibration of gauges.
- Archimedes law.
- Stability of a floating body.
- Pressure energy, potential and kinetic.
- Pressure on submerged surfaces.
- Metacentric height.

**TECHNICAL DATA****Tank:**

- Storage capacity 50 litres. With submersible pump.

**Densities:**

- Pycnometer volume 50ml.
- Hydrometers
  - From 700 to 800
  - From 800 to 900
  - From 900 to 1000
  - From 1000 to 1100
  - From 1100 to 1200
  - From 1200 to 1300
  - From 1300 to 1400
  - From 1400 to 1500
  - From 1500 to 1600

**Dynamometers:**

- 100g/1N; resolution: 2g/0,02N.
- 250g/2,5N; resolution: 5g/0,05N.
- 500g/5N; resolution: 10g/0,1N.
- 1000g/10N; resolution: 20g/0,2N.
- 2000g/20N; resolution: 40g/0,4N.
- 5000g/50N; resolution: 100g/1N.

**Capillarity:**

- Diameter glass tubes:
  - $\varnothing_{in} = 17,3$  mm
  - $\varnothing_{in} = 5$  mm
  - $\varnothing_{in} = 2,1$  mm
  - $\varnothing_{in} = 1,4$  mm

**Manometers:**

- Barometer.
- 2 Column water 500 mm.
- Diferential 500 mm.
- Adjustable inclined at 15, 30, 45 and 90.

**Other elements:**

- Falling ball viscometer:
  - Steel spheres.
    - $\varnothing$  4 mm
    - $\varnothing$  5 mm
    - $\varnothing$  7 mm
    - $\varnothing$  8 mm
- Electronic balance 5Kg x 1g.

**Dimensions:**

- 1715 x 1900 x 800 mm

**REQUIREMENTS**

- Electrical connection: 230V / 50Hz.