METACENTRIC HEIGHT

DL DKL102

Archimedes' principle indicates that the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid that the body displaces. This trainer is intended for the study and determination of the metacentric height of a floating body, which acts like a ship.

The intersection point between the vertical axis and with the vertical line from the center of the hull it is called Metacentre. Metacentric height is the distance from the metacentre to the gravity center of the floating body.

In the study of the equilibrium of a floating object, such as a boat , three cases have to be distinguished:

- Stable equilibrium: If the metacentre is above the center of gravity, it will remain in equilibrium.
- Unstable equilibrium: If the metacentre is below the center of gravity, there is a deviation between the vector of the floating object and the buoyant force of the fluid in which it floats, making some tilting, and thus the deviation tends to increase.
- Neutral equilibrium: If the metacentre matches with the center of gravity, the metacentric height is equal to zero.

It is possible to perform calculations in different situations so to clearly understand the Archimedes' principle and the stability of a floating object. Moreover the position of the center of gravity of the floating object can be changed moving the calibrated rulers to control the position of the weights and to check directly the inclination angle of the barge.

FLUID MECHANICS

TRAINING OBJECTIVES

- Calculation and study of metacentric height of a floating object.
- Study of the Archimedes' principle.

TECHNICAL DATA

Barge:

- External dimensions: 350 x 200 x 100mm
- Wall width: 6mm

Weights:

- Movable horizontal counterweight: 500g
- Movable vertical weight on the mast: 200g

  For each supplied equipment, the mass of the weights is calibrated.

Further information:

- Maximum angular deviation: 33°
- Counterweight linear deviation: ±90mm
- Barge total weight: ca. 2.300g
- Mast height: 400mm