

# HM 150.06

## Stability of floating bodies



### Learning objectives/experiments

- study and determination of
  - ▶ buoyancy, centre of buoyancy
  - ▶ centre of gravity, metacentre, stability
  - ▶ heel

### Description

- **stability of a floating body**
- **determining the metacentre**
- **other floating bodies with different shapes of frame optionally available, HM 150.39**

In hydrostatics, the metacentre is an important point to be considered when assessing the stability of floating bodies. Stability refers to the ability of a ship to right itself from a heeled position. The metacentre is the intersection of the buoyancy vector and the vessel's axis of symmetry at a certain heel.

The HM 150.06 unit can be used to study the stability of a floating body and to determine the metacentre graphically. In addition, the buoyancy of the floating body can also be determined. The experiment is easy to set up and is particularly suitable for practical work in small groups.

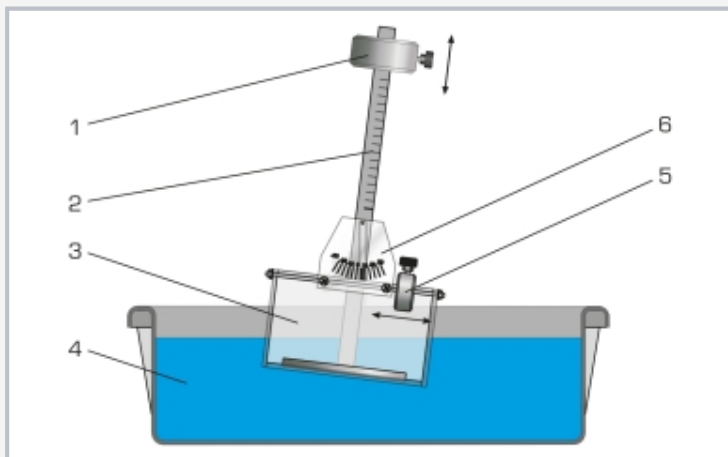
The experiment is conducted in a tank filled with water. A transparent body with a rectangular frame cross-section is used as the floating body. Clamped weights that can be moved horizontally and vertically make it possible to adjust the centre of gravity and the heel.

The position of the clamped weights can be read on scales. A clinometer indicates the heel.

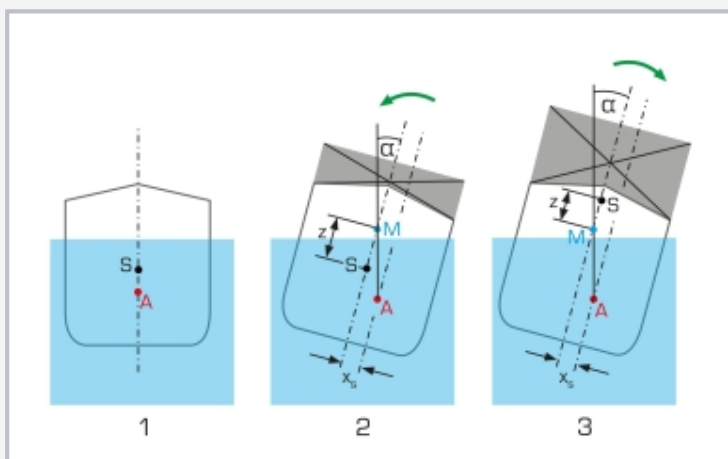
The accessory HM 150.39 is available as an optional extra for further experiments with different frame shapes.

# HM 150.06

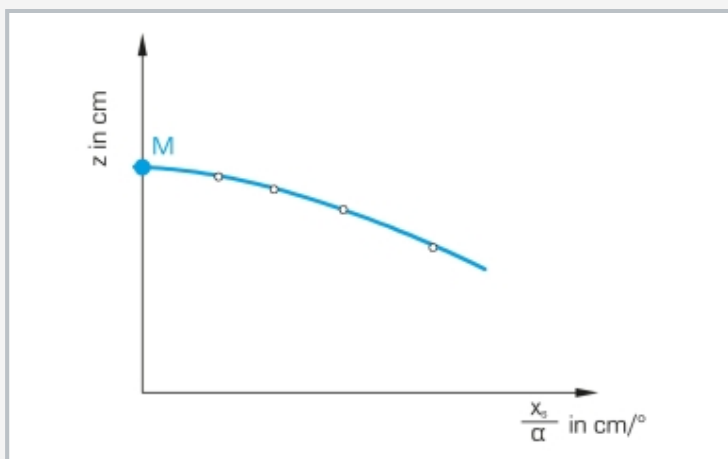
## Stability of floating bodies



1 adjustment of the centre of gravity, 2 scale, 3 floating body, 4 tank with water, 5 adjustment of the heel, 6 clinometer with scale



1 stable position, 2 stable position despite load, metacentre above the centre of gravity, 3 unstable position due to load, metacentre under the centre of gravity, green arrow: restoring moment, M metacentre, S centre of gravity, A centre of buoyancy, z metacentric height,  $\alpha$  angle of heel



Graphical determination of the metacentre: M metacentre, z vertical centre of gravity,  $x_s / \alpha$  stability gradient

### Specification

- [1] investigating the stability of a floating body and determining the metacentre
- [2] transparent floating body with rectangular frame cross-section
- [3] one horizontally movable clamped weight for adjusting the heel
- [4] one vertically movable clamped weight for adjusting the centre of gravity
- [5] clinometer with scale for displaying the heel
- [6] other floating bodies with different shapes of frame available as accessories: HM 150.39

### Technical data

#### Floating body

- LxWxH: 300x130x190mm
- mast height: 400mm

Horizontal scale: 180mm

Vertical scale: 400mm

Height scale of the floating body: 120mm

Clinometer scale:  $\pm 30^\circ$

#### Weights

- floating body without clamped weights: approx. 2,7kg
- vertical clamped weight: 575g
- horizontal clamped weight: 196g

Tank for water: 50L

LxWxH: 660x450x220mm (tank)

Weight: approx. 6kg

### Scope of delivery

- 1 experimental unit
- 1 set of instructional material

# HM 150.06

## Stability of floating bodies

Optional accessories

HM 150.39	Floating bodies for HM 150.06
WP 300.09	Laboratory trolley