HM 159.11 *Ship Vibration Apparatus*

*** Dynamic behaviour of a ship structure**

*** Simple ship form simplifies mathematical calculations**

*** Different exciter signals possible**

*** Selectable exciter and measuring points**

Technical Description

The HM 159.11 is used to investigate the dynamic behaviour of a ship structure. It therefore allows the first steps in the area of experimental vibration analysis or modal analysis.

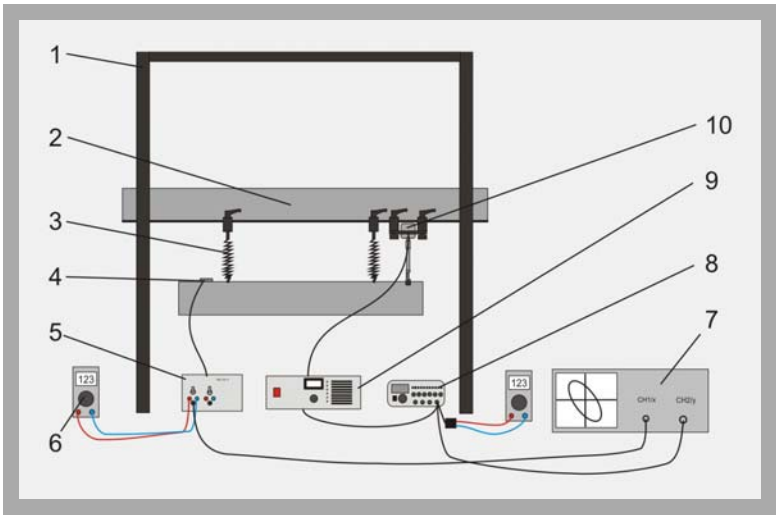
Experimental vibration analysis is an indispensible element of modern shipbuilding development activity. This trainer allows the natural frequencies and modes of the model ship to be measured and recorded. The simple, stylised ship form simplifies the mathematical resolution of the problem. The model ship and an electrodynamic exciter are attached to a height adjustable cross beam. The beam has a high natural frequency that doesn't interfere with the measurements. A function generator creates different exciter signals: sinusoidal, triangular and rectangular signals. The frequency, amplitude and offset are adjustable. An acceleration sensor at various points measures the response of the model to the vibrations generated.

For experiments in water, a tank is required (not included).

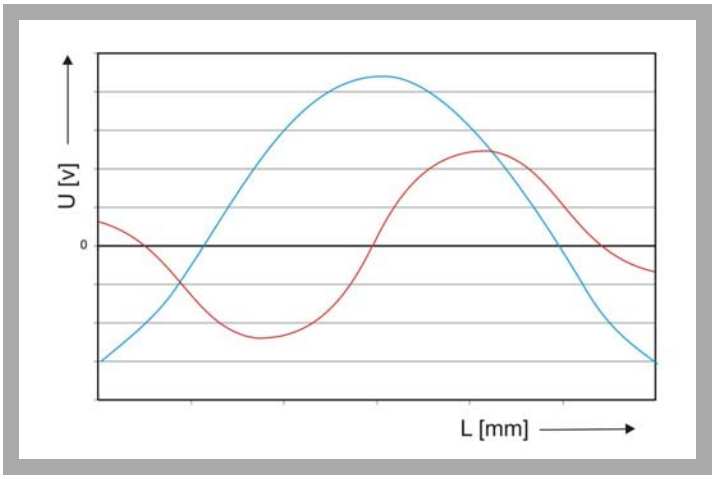
Learning Objectives / Experiments

- Measurement and recording of natural frequencies and modes of the model ship (in air)
- Influence of discrete additional masses or ballast on natural frequency and mode (ballast and additional masses not included)
- Vibration behaviour of model in air
- Vibration behaviour of floating model (possible with additional tank)
- Comparison of theory (approximation formula for determination of first bending natural frequency) and practice (measured natural frequency)

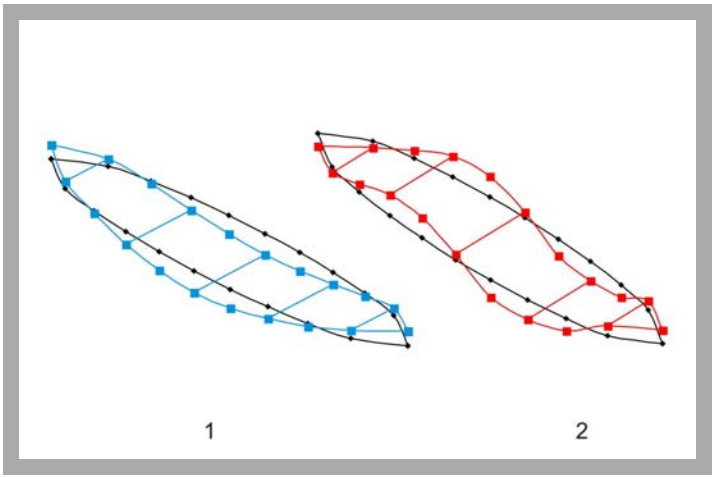
HM 159.11 Ship Vibration Apparatus



1 frame, 2 height adjustable cross beam, 3 tension springs for model suspension, 4 acceleration sensor, 5 measuring amplifier, 6 multimeter, 7 oscilloscope (not included), 8 function generator, 9 power amplifier for exciter, 10 exciter



tension of acceleration sensor, plotted versus length of model ship
blue: first order natural frequency, red: second order natural frequency



blue: first order natural frequency, red: second order natural frequency

Specification

[1] Vibration behaviour of a model ship in air or in water (with additional tank)
[2] Frame with height adjustable cross beam
[3] High natural frequency of cross beam due to closed box beam section with high rigidity and low weight
[4] Plastic model ship with elliptical half-breadth plan and 9 deck stringers
[5] Capacitive acceleration sensor with measuring amplifier
[6] Exciter with co-ordinated power amplifier and function generator: sinusoidal, triangular or rectangular signal
[7] Representation of measuring values on an oscilloscope possible (not included)

Technical Data

Exciter
- electrodynamic type with permanent magnet
- max. force: 8.9N
- frequency range: 5...12,000Hz

Function generator
- frequency, amplitude and offset adjustable
- output: 0...10Vpp, 50 Ohm

Acceleration sensor
- measuring range: +/-5g
- frequency range: 0...400Hz

Model ship
- deck stringer with fastening holes for sensors and suspension

Dimensions and Weight

l x w x h: 1800 x 400 x 1700 mm (frame)
l x w x h: 1200 x 200 x 150 mm (model ship)
Weight: approx. 50 kg

Connections

230V, 50Hz, 1 phase

Scope of Delivery

1 frame
1 model ship, 4 tension springs, 1 measuring amplifier, 1 power amplifier, 1 exciter, 1 function generator, 2 multimeters, 1 acceleration sensor
1 set of cables
1 manual

Order Details

070.15911 HM 159.11 Ship Vibration Apparatus