2. Preliminaries

Units, Constants

Mathecad permits to handle physical quantities, but all data are being used without their SI units in view of further use in mathematical subroutines, which by definition cannot handle arguments with units.

Concerning this fundamental matter please refer to my detailed draft of a proposed new edition of the standard DIN 1313 'Grössen', to be found on my website in the Section 'News on general subjects' under the title 'Concepts, magnitudes and quantities'.

**Units**

- **Force**
  - \( N := \text{newton} \)
  - \( kp := \text{g} \cdot \text{N} \)

- **Torque**
  - \( \text{Nm} := \text{newton} \cdot \text{m} \)

- **Power**
  - \( W := \text{watt} \)

**Constants**

- **'Gravity field'**
  - \( g := 9.81 \cdot \text{m} \cdot \text{sec}^{-2} \)
  - \( g := \text{g} \cdot \text{m}^{-1} \cdot \text{sec}^{2} \)
# Model data VWS 2491/1340

## Test identification
- **TID := "VWS 2491 / 1340"
- **Date := 860909
- **Test := 8

## Basic data

### Ship model VWS Mod. 2491.0

Barge Carrier, which has not been built, body plan and contours of stem and stern to be found in the first appendix.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>$L_{\text{mod}} := 6.5 \cdot \text{m}$</td>
</tr>
<tr>
<td><strong>Breadth</strong></td>
<td>$B_{\text{mod}} := 1.00 \cdot \text{m}$</td>
</tr>
<tr>
<td><strong>Draught</strong></td>
<td>$T_{\text{mod}} := 0.255 \cdot \text{m}$</td>
</tr>
<tr>
<td><strong>Displacement</strong></td>
<td>$\Delta_{\text{mod}} := 1.431 \cdot \text{m}^3$</td>
</tr>
<tr>
<td><strong>Block coefficient</strong></td>
<td>$\phi := \frac{\Delta_{\text{mod}}}{L_{\text{mod}} \cdot B_{\text{mod}} \cdot T_{\text{mod}}}$</td>
</tr>
<tr>
<td><strong>Density of tank water</strong></td>
<td>$\rho := 1.00 \cdot 10^3 \cdot \text{kg} \cdot \text{m}^{-3}$</td>
</tr>
<tr>
<td><strong>Mass of model</strong></td>
<td>$m_{\text{mod}} := \rho \cdot \Delta_{\text{mod}}$</td>
</tr>
<tr>
<td><strong>Hydrodynamic inertia</strong></td>
<td>$\mu_{\text{hyd}} := 0.0259$</td>
</tr>
<tr>
<td><strong>Total inertia</strong></td>
<td>$I_{\text{mod}} := m_{\text{mod}} + m_{\text{hyd}}$</td>
</tr>
<tr>
<td><strong>Model scale</strong></td>
<td>$\lambda := 37.23$</td>
</tr>
<tr>
<td><strong>Location of trip wire</strong></td>
<td>$x_{\text{wire}} := 19.25$</td>
</tr>
<tr>
<td><strong>Surface</strong></td>
<td>$S := 8.967 \cdot \text{m}^2$</td>
</tr>
</tbody>
</table>

The following value has been derived from data for a three dimensional ellipsoid, figure 67 on pages 244-245 in the monograph of W.G. Price and R.E.D. Bishop: Probabilistic Theory of Ship Dynamics. London: Chapman and Hall, 1974. The very small value is slightly larger than from others found in the literature. Details are not of interest in the present context.
Propeller model VWS Prop. 1340

CP propeller, right handed

Diameter of propeller
\[ D_P := 0.195 \, \text{m} \quad D_P := D_P \, \text{m}^{-1} \]

Disc area
\[ A_P := \frac{\pi \cdot D_P^2}{4} \quad A_P = 0.02986 \]

Pitch ratio, design
\[ P_{D,\text{des}} := 0.825 \]

Pitch ratio, actual
\[ P_{D,\text{act}} := 0.813 \]

Number of blades
\[ Z := 4 \]

Model test conditions

Carriage velocity
\[ F_n := 0.168 \]
\[ V_{HG,0} := F_n \cdot \sqrt{g \cdot L_{\text{mod}}} \quad V_{HG,0} = 1.342 \]

Frictional deduction
\[ F_F := 12.5 \]

‘Course’, nominal
\[ \psi_{HG} := 0.0 \]

Tank dimensions
\[ h := 4.2 \]
\[ L := 240 \]

END

2. Preliminaries