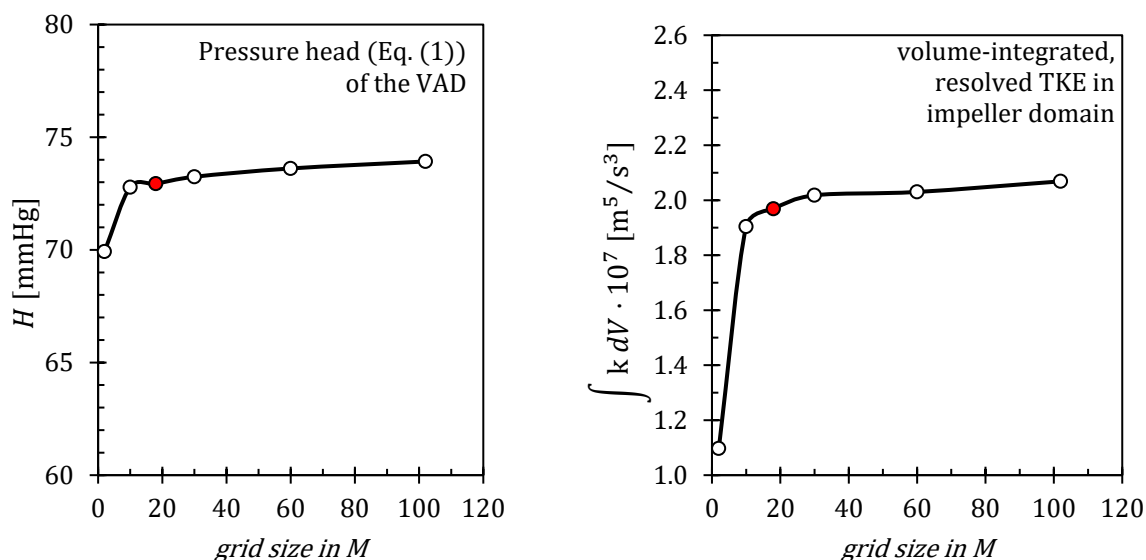


## Supplementary Material



**Figure S1.** Analysis of flow variables on different grid sizes. Left: Pressure head  $H$ . Right: Volume-integrated, resolved turbulent kinetic energy  $k$  in the impeller domain. The red dot indicates the solution on the grid which was applied for the analysis.

The variations of characteristic flow variables on different grid sizes were evaluated to analyze the degree of grid convergence for the flow simulation on the used grid (20M grid cells). This is shown in the Figure S1, where the pressure head  $H$  (as a representative for the pump characteristics) and the volume-integral of the resolved, turbulent kinetic energy  $k$  (as an indicator for the turbulence resolution by LES) were plotted against the number of grid points. The resolved TKE is defined as:

$$k = \frac{1}{2} \langle c_i' c_i' \rangle.$$

As can be seen from this figure, the variations on the finer grid sizes ( $> 20 M$  grid cells) is small, indicating a convergent solution for the grid under investigation.