Force signals can be acquired from the sensor integrated into the Arduino system with a sampling frequency of 80 Hz. An example of such a signal is shown on Figure 1. A dominant frequency and a mean value can be determined in order to characterize the dynamics of the Dshape body. For a set of velocities in the wind tunnel and a value of thickness (rigidity) and length $L = 1.50D$ of the flexible plates, we display the behavior of the signals which are proportional to the drag force in Figure 2. Values must be corrected by subtracting those corresponding to the mounting structure. Nevertheless, by scaling the former with u_∞^2, we can obtain magnitudes proportional to the drag coefficient C_D as presented in Figure 3.

The determination fo the main frequencies in the force signals is obtained through Fourier analysis. Figure 4. shows the power spectral density of the signal as a function of the frequencies of the reference case, where there is no flexible flaps mounted on the body. Taking an order value of $St = 0.2 = f_{vs}D/u_\infty$, for $D = 50\,\text{mm}$ and $u_\infty = 3.5\,\text{m/s}$, the vortex shedding frequency results $f_{vs} = 14\,\text{Hz}$. Inspecting Figure 4, we can compare with the maximum peak found at $f_{\max} = 12.67\,\text{Hz}$.

Fast camera images were recorded at a sampling frequency of 250 µs. A particular snapshot is shown on Figure 6 where we can determine the elastic deformation. produced by the flow. We are particularly interested in following the trailing edges displacement, so we can produce a stack of images for each

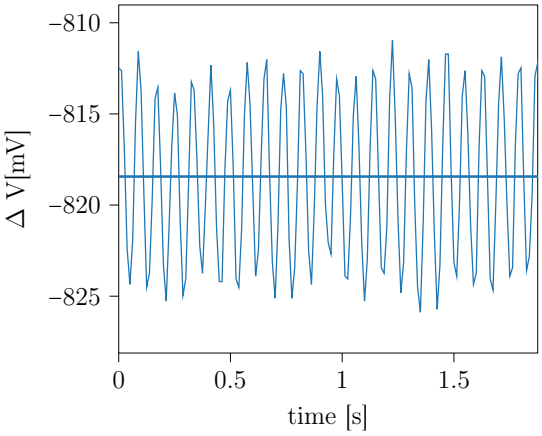


Figure 1: A typical signal for the force measurements.

time of acquisition at the regions of interest. The result is displayed on Figure 7 where we can study the fluctuations, their frequency and compare with those produce by the forces on the body.

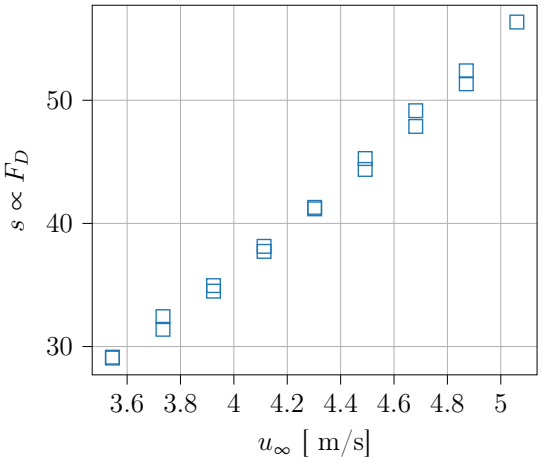


Figure 2: A series of time averaged force measurements for $t = 75$, $L = 1.50D$

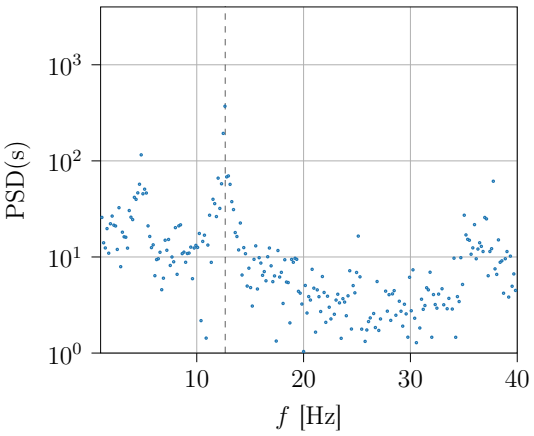


Figure 4: FFT of s. $t = 0$, $L = 0D$, $U = 3.5m/s$

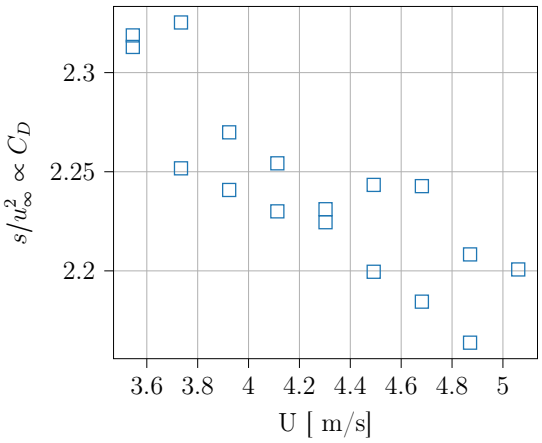


Figure 3: C_D estimation for $t = 75$, $L = 1.50D$

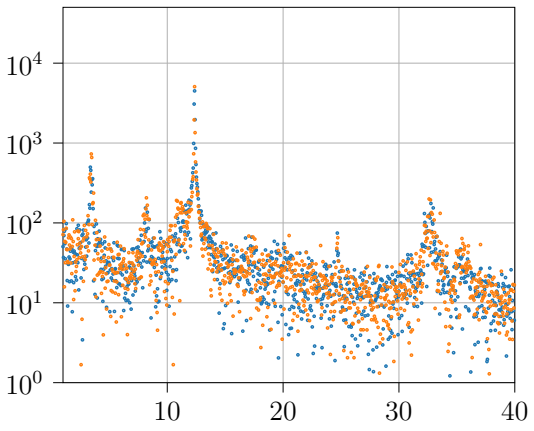


Figure 5: FFT of s. $t = 75$, $L = 1.50D$, $U = 3.5m/s$

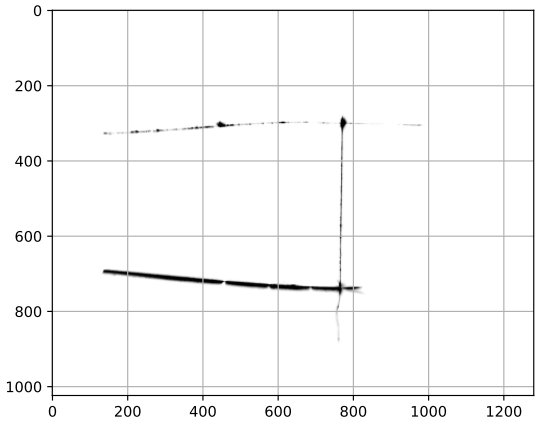
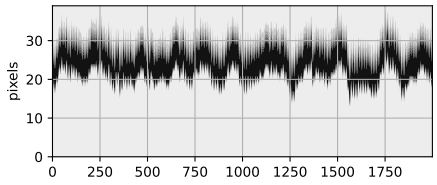
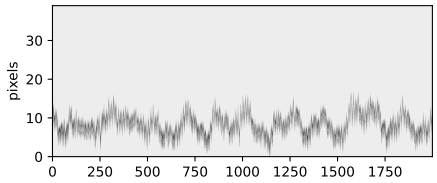


Figure 6: Snapshot for the body with flexible plates..



(a)



(b)

Figure 7: Stack of images for the trailing edge of the flexible plates.