S1 Calculation of the pump input variable ranges

While the physical pump has the rotor speed as input, its operation is described through the pressure-flow curve, or simply the H-Q curve. The H-Q curve is a function of the pump speed and the characteristics of the inlet and outlet tubings, as these tubing affect the system pressure drop. To fit the pump H-Q curve model (Equation 3 in main document), the San Diego State University (SDSU) recovered the H-Q performance curves of the used pump for multiple speeds. These measurements are shown as marks in Fig. 1. These measurements were fitted by a non-linear least squares method to a second order polynomial to obtain the left ventricular assist device (LVAD) pump coefficients (Table 5 in the main document). As, for this data $c_{VAD} \sim 0.0$ in every case, the quadratic coefficient was forced to zero $c_{VAD} \equiv 0.0$. The fittings are shown as lines in Fig. 1. The fitting error $\epsilon_{fit}$, shown as a light gray area in Fig. 1, is calculated as the square root of the diagonal of the fitting covariance matrix, also called the standard deviation. To account for experimental error $\epsilon_{exp}$, we include a 10% error range for each coefficient, shown as dark gray in Fig. 1.

Fig. 1: Different H-Q curves measured for the pump operating at multiple speeds (5k, 8k, 11k, 14k[rpm]). The light grey area is representing the measured fitting (numerical) error $\epsilon_{fit}$ and the dark grey area is representing the assumed experimental error $\epsilon_{exp}$. 