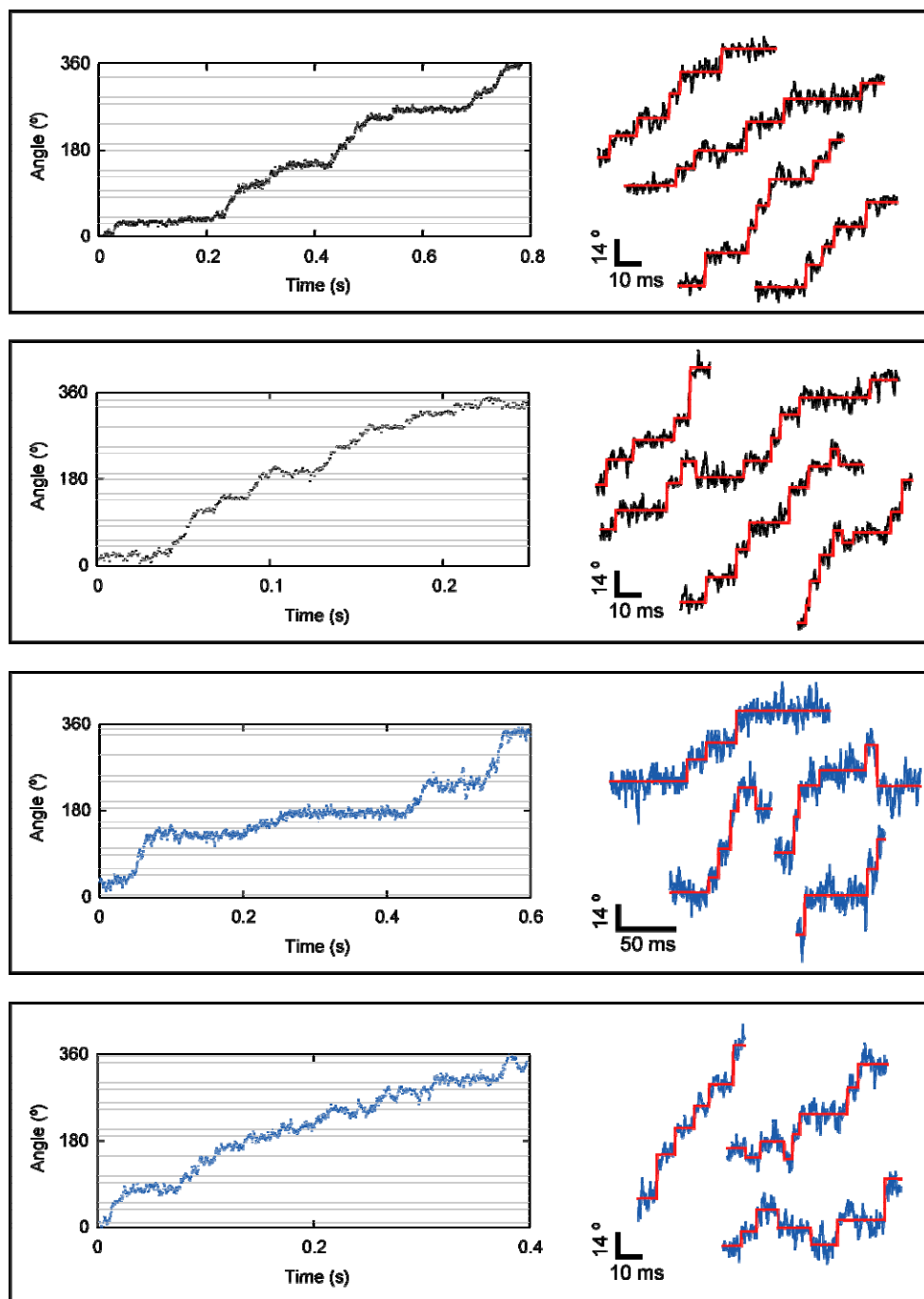


Supplementary Figure 1.

a, The effect of changing external Na^+ concentration (85 mM to 0.1 μM and back, at the black arrows) on stator-unit number. Unlike cells used for step experiments, this cell was previously exposed to 100 μM IPTG for 30 min. The speed was detected by the bfp method with a 500 nm bead. The speed increment after restoration of 85 mM sodium is 40 Hz and the motor recovers up to 6 units (red arrows). The recovery is similar to resurrection following induced expression of stator units, and indicates reversible inactivation of stator units upon disruption of the smf. The initial speed of 400 Hz corresponds to ~10 units in the motor.

b, A histogram of estimates for the initial number of stator units in 22 different motors under the same growth conditions as used for step experiments. The speed of each cell before first exposure to low $[\text{Na}^+]$ was used to estimate the stator number, by assuming that each stator adds 30 Hz or 40 Hz to the speed of rotation in 85 mM or 5 mM $[\text{Na}^+]$ respectively. The mean and S.D. are 4.3 and 2.1 units/motor, respectively.



Supplementary Figure 2.

More examples of stepping rotation. Single revolutions are shown (left) from 4 different motors, each different from the 3 different motors used in Figs. 2 and 3 in the text. Selected short sections from the same cells are expanded (right). Blue and black traces are from bfp and fluorescence experiments respectively and superimposed red lines are the output of the step-finding algorithm, as in Fig 3a.