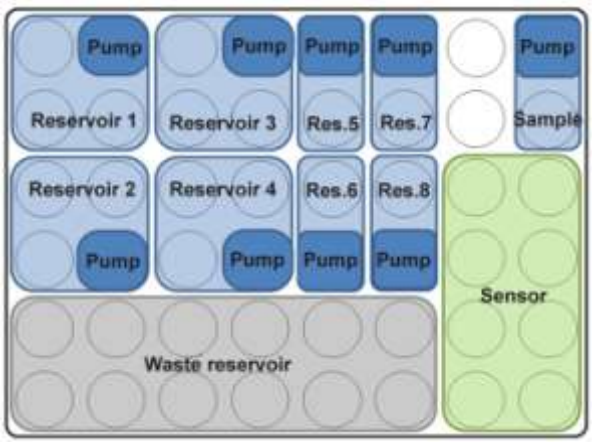
1 **Electronical supporting information**

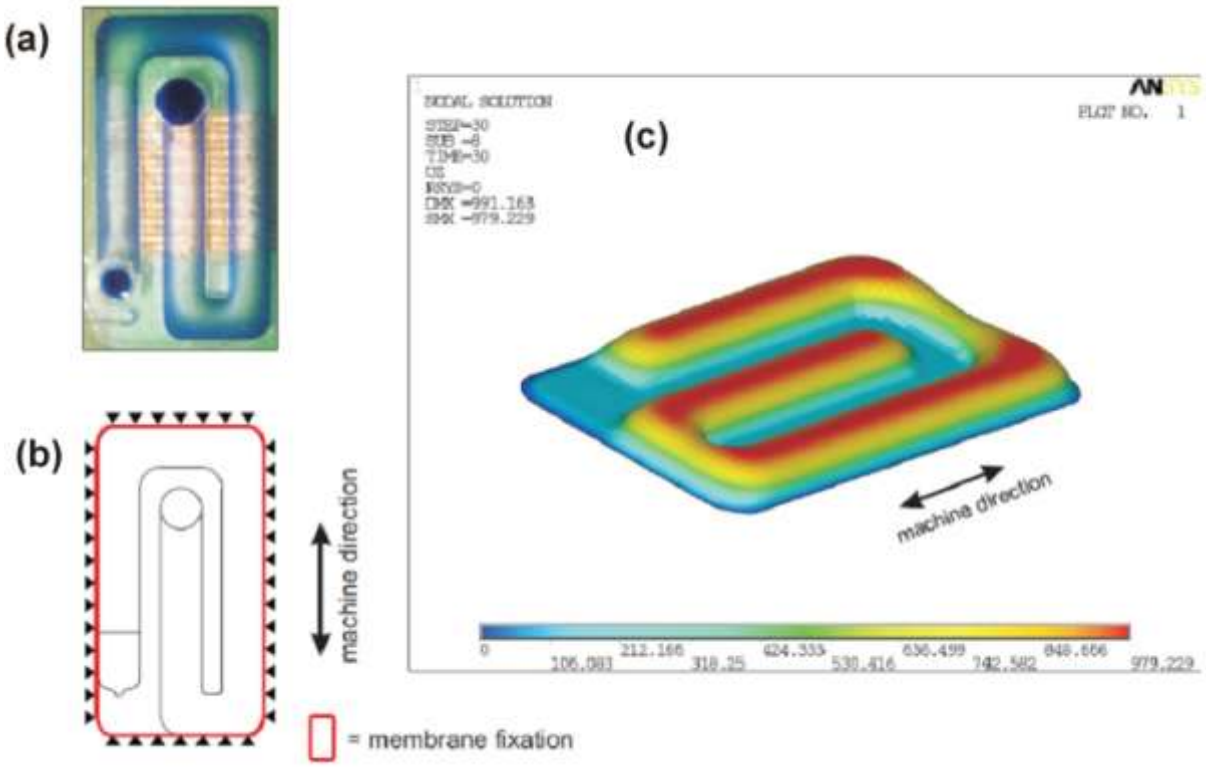
2



3

4 **Fig. S1** Principal layout of the cartridge (1/2 of a microtiter plate; credit card size)

5



6

7 **Fig. S2 (a):** Photography of the membrane deflection inside an ink-filled reservoir (same state as

8 FEM simulation). It can be clearly seen how the blue ink is displaced out of the reservoir and the

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membrane hits the top of the meandering channel. **(b):** Membrane fixation underneath the meandering reservoir. The membrane is attached in the direction depicted. **(c):** FEM simulation of the membrane deformation due to the applied electrolytic gas pressure.

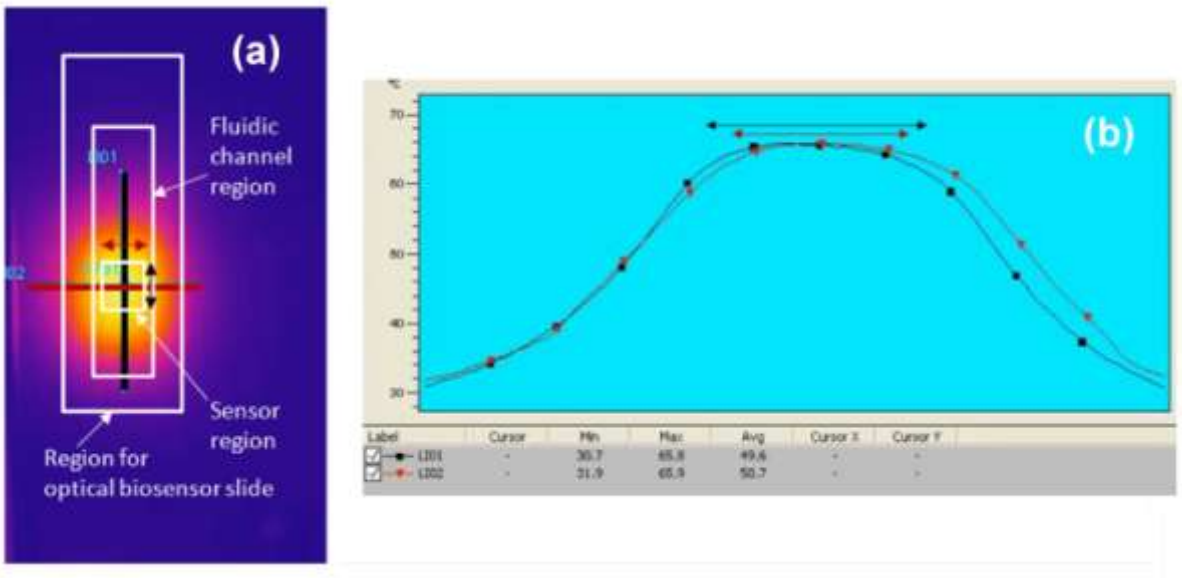

Fig. S4 (a) Infra-red (IR) image of the heating zone for an operating current of 12 mA referring to 65°C. **(b)** Spatial temperature distribution along the red and black line in the IR image.

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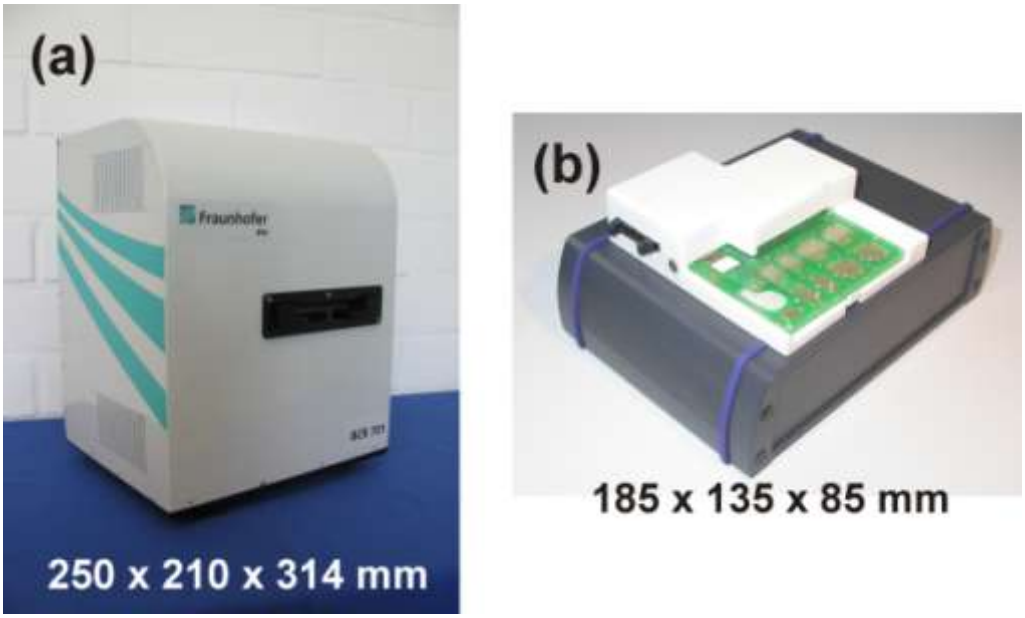

Fig. S5 Read-out units for either optical **(a)** or electrochemical sensing **(b)**

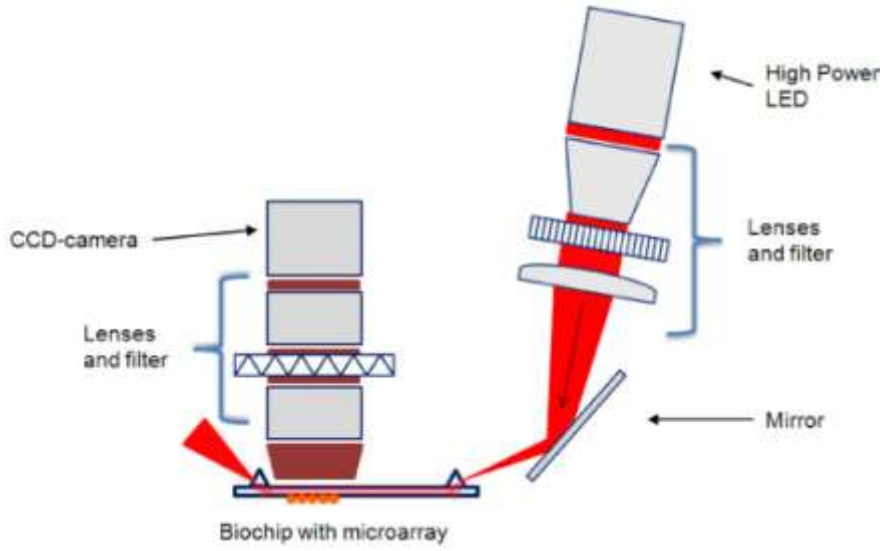

Fig. S6 Schematic representation of the optical system within the read-out and processing device

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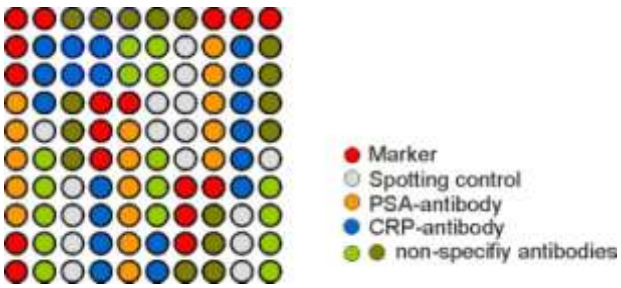

Fig. S7 Spotting layout for the simultaneous detection of CRP and PSA

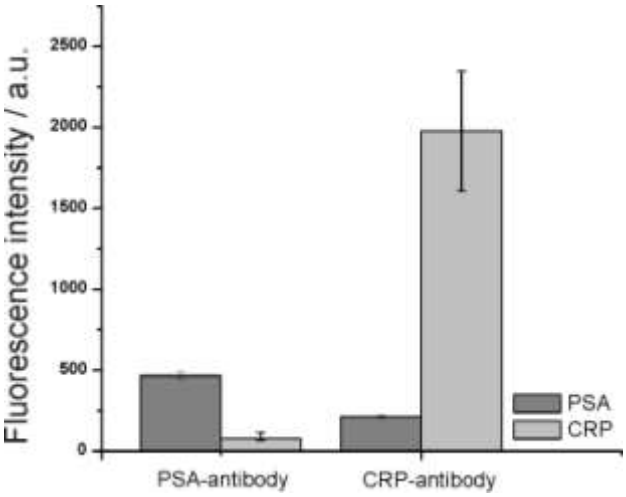

Fig. S8 Determination of crossreactivity between PSA and CRP and its binding antibodies; dark gray bars are PSA as analyte, light grey bars are CRP as analyte

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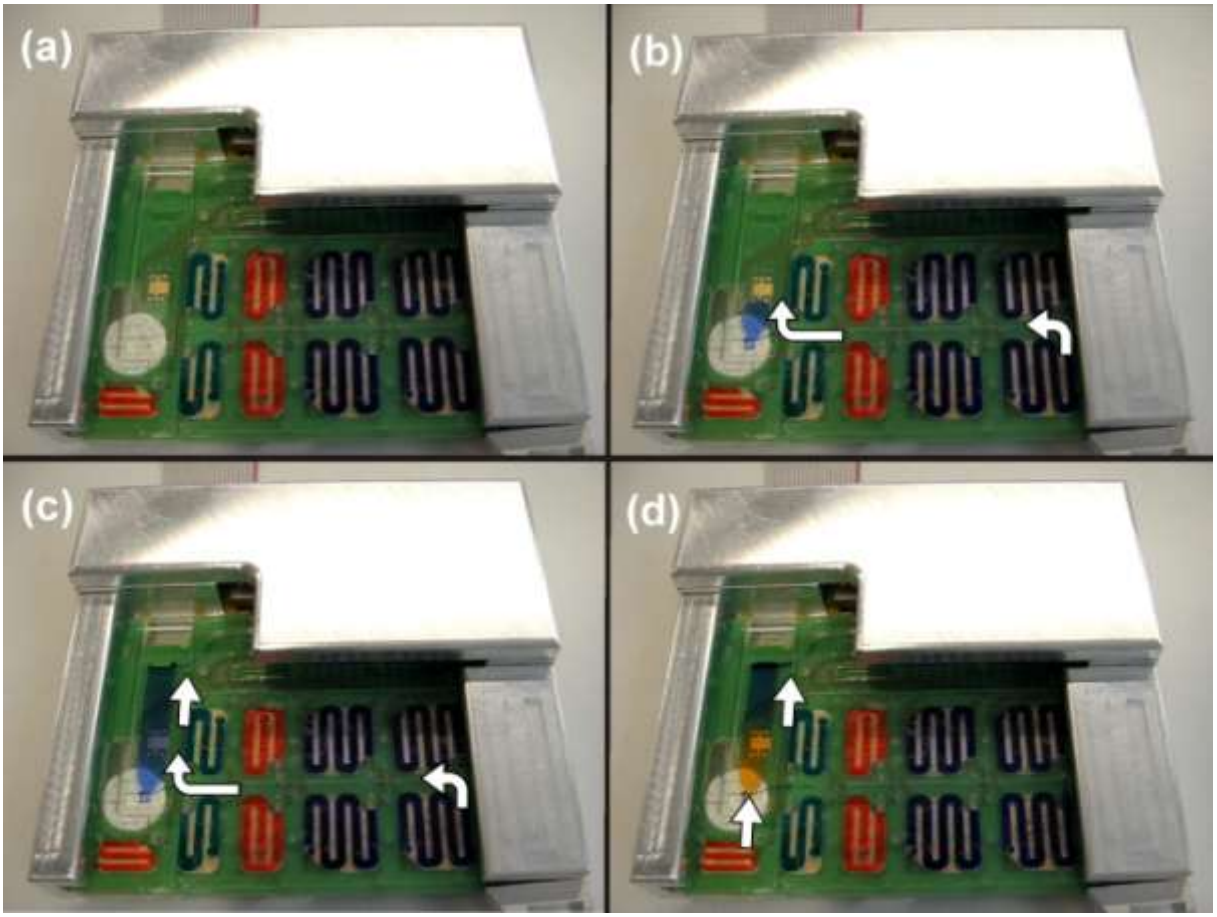

Fig. S3 Pumping sequence of the first two reservoirs **(a-d)**. For illustration, the cartridge has been filled with inked water and was placed in an external cartridge holder. It can be seen by looking at the arrows that differently colored ink is pump via the sensor field. In picture **a** the sample reservoir is empty, in figure **b** blue colored ink goes into the sensor field, figure **c** shows the filling of the sensor field, figure **d** shows change to the orange ink.

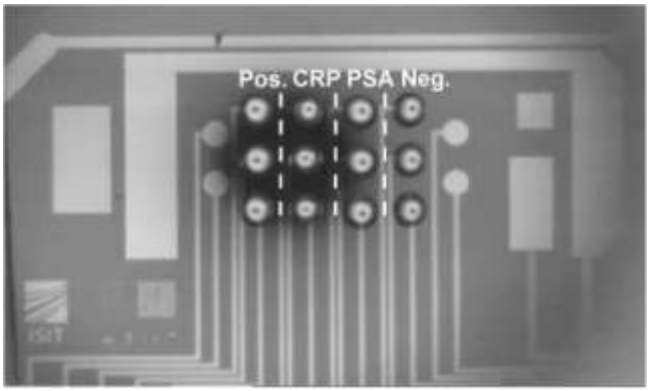

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Fig. S9 Spotted electrochemical chip for the simultaneous detection of CRP and PSA, in addition a positive and negative control were spotted

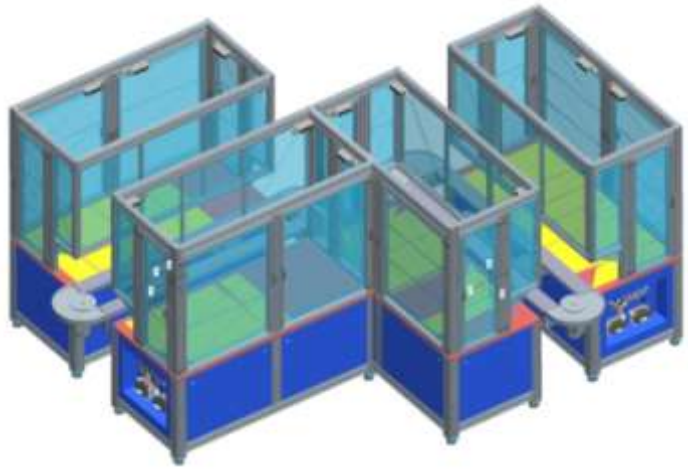

Fig. S10 Conception of a modular assembly and processing line. Single modules can be attached and are connected via conveyer belts.

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