

HIGH PRECISION MIXING RATIOS

Keywords: Asymmetric ratios, independent syringes, high dilution, microliter volume delivery

The ability to change mixing ratios easily and precisely is a key technical advantage in stopped-flow technology. It is especially important in protein folding/unfolding studies. In these applications a protein is mixed with a buffer and denaturant. The concentration of denaturant is varied to build Chevron plots, and the ability to change the mixing ratio rapidly is important. Concentration dependence studies in organic/inorganic chemistry or biology also require easily changed mixing ratios to get information about the reaction mechanism rapidly, with the best use of laboratory time.

Bio-Logic's SFM instruments use independent stepping motor technology which lets the user freely select mixing ratios in software. A series of concentration dependent samples can be run in a few minutes. **Only Bio-Logic can propose a fully variable control of mixing ratio.** Systems based on pneumatic drive or single drive units needs to change volume of one of the drive syringe to change mixing ratio, it means your mixing ratio possibilities are forced by the syringe you have (4 to 5 possibilities maximum). Single drive ram system also has a very limited mixing ratio range.

The SFM mixing ratio is changed easily in the software (figure1). Symmetric and asymmetric ratios can be done without mechanical rearrangement by simply entering the desired ratios in software. With competitive system a change of ration means a physical change of syringe and sometimes a drain of temperature circuit.

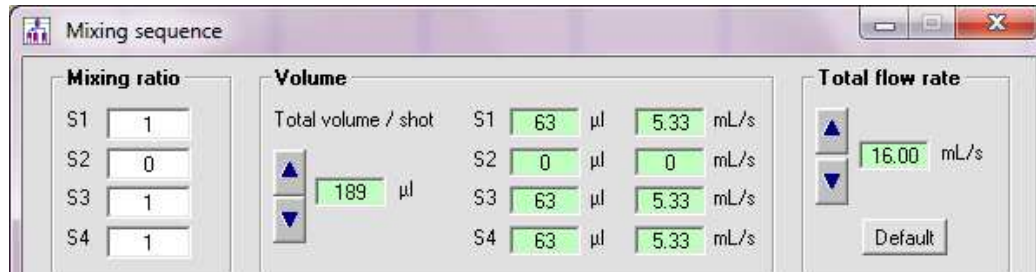


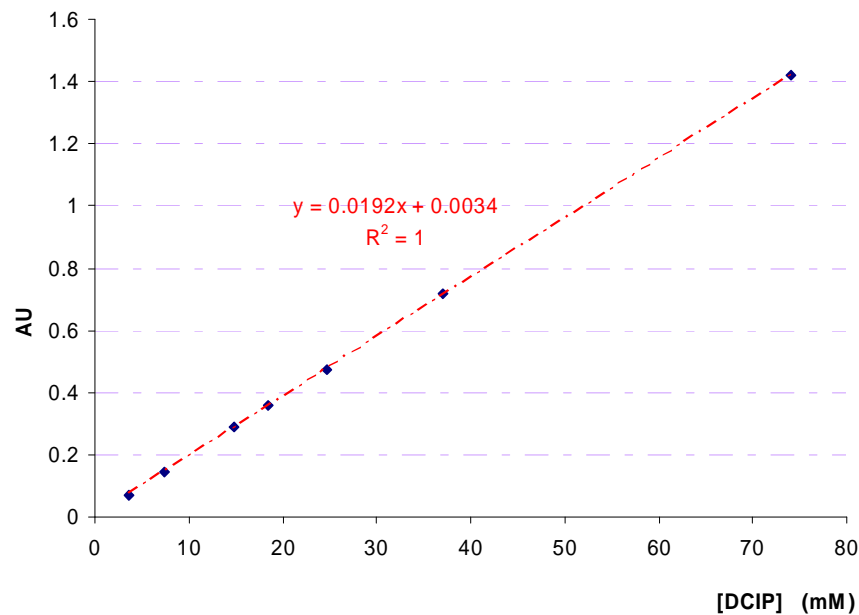
Figure 1: mixing sequence program

The precision of mixing ratios can be easily demonstrated with dilution test, and **precision** of volume delivery is incomparable.

Demonstration:

Instrument: SFM 2000/S equipped with 10mL syringes and TC100/10F cuvette with a 1cm path length
70mM DCIP in a phosphate buffer is mixed with phosphate buffer at different ratios. Dilutions by 2, 3, 4, 5, 10 and 20 are performed.

Concentration	Absorbance measured	Deviation from the theoretical result
74mM	1.42	-
37mM	0.717	0.9%
24.66mM	0.475	0.4%
18.5mM	0.358	0.8%
14.8mM	0.287	1%
7.4mM	0.146	2.8%
3.7mM	0.720	2.4%



Graph 1: Absorbance measured = $f(\text{concentration})$

This demonstrates using a Bio-logic Stopped flow with Biokine software to collect a concentration series with mixing ratios from 1:1 to 1:20. No mechanical reconfiguration was required. The variations are less than 3%. Syringe combinations can be selected to optimize performance for mixing ratios from 1:1 to 1:100.

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