



# QFM-4000

## Micro-Volume Quench-Flow

- Single mixing quench-flow experiment
- 4 ms minimal ageing time
- 10  $\mu\text{l}$  of sample per experiment
- Full recovery of sample
- One delay line for full ageing time range
- Easy operation
- No calibration



# Save samples

# Save time

# Save money

Since 1983, BioLogic has brought innovation and performance to rapid kinetics users.

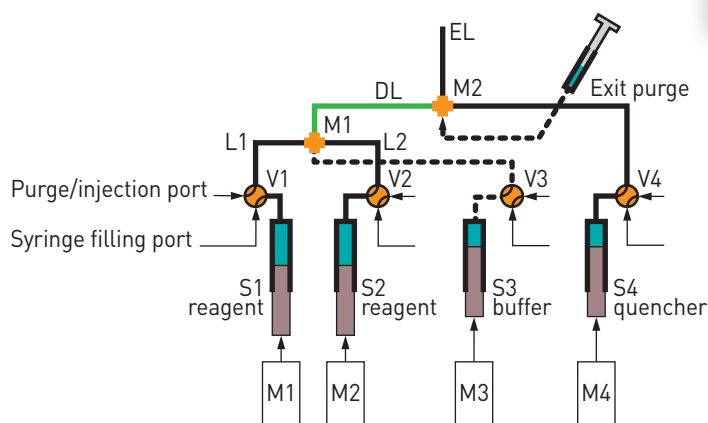
Our technology, independent motors, EMFA\* method, CD kinetics, etc... have made us the leading company in the rapid kinetics field. BioLogic has a long experience in quench-flow instrumentation. The SFM-4000/Q is the reference for triple mixing experiments such as De/H exchange, and QFM-400 has been the reference for microvolume operation for years.

The **QFM-4000 Micro-Volume Quench-Flow system** is capitalising on the success of QFM-400 and is taking advantage of the latest SFM-series technology. The advanced design of the QFM-4000 allows the measurement of chemical reaction rates from a few milliseconds to many minutes. The quench flow technique is widely recognized for analyzing enzymatic reactions, single turnover reactions, and DNA cleavages. It is also widely used to identify reaction intermediates.

The **QFM-4000 is the MUST HAVE instrument** for all single mixing quench-flow applications. It offers the best specifications in the world in terms of sample consumption, user-friendliness, modularity and automation.



SCHEMATIC OF QFM-4000



Each syringe is driven by an independent stepping motor.

Solutions are loaded into the instrument using 4 position valves, which are also used to select the traditional quench-flow mode, or extra-small volume mode.

Mixers are specially engineered to provide turbulent mixing over a very large range, so that a single delay line can be used for all ageing times from 4 ms to several seconds.

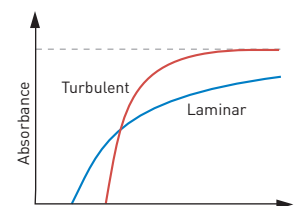
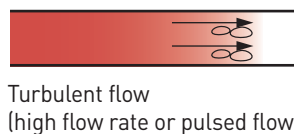
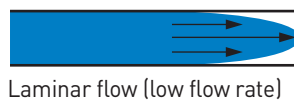
Reactions are stopped in mixer 2, and the aged solution is flushed through an exit line to a collect device.

\*EMFA : Excitation Modulated Fluorescence Anisotropy

## A unique design based on a single delay line

With classical quench-flow technology, the user must carefully select a set of delay lines, or reaction loops, to reach the desired ageing times. The range of ageing times that can be achieved in each line is usually determined by the turbulent/laminar flow limit. Changing delay lines is usually easy, but can require very tedious calibration procedures for single drive instruments.

The **QFM-4000** was designed around an innovative pushing method developed at BioLogic. The syringes are driven by independently micro-processor controlled stepping motors. Each precision motor allows 6400 steps per revolution, and provides sub-micro-liter precision for sample delivery. Following the syringe driver is unique mixing technology which generates turbulent flow from very low to very high mean flow rates. The overall results are outstanding: using a 3  $\mu\text{l}$  delay line, the user can vary the ageing time from 4 ms to tens of seconds without changing delay lines or syringes. The **QFM-4000** is the only quench flow mixer available with single delay line technology, and is a major breakthrough for quench-flow techniques.



Absorbance at the exit of the tube as a function of washing volume

## Principle

In normal operation solutions are loaded in the driving syringes through four position valves. With the included control software, the user selects injection volumes and delay times. After the solution is mixed, delayed, and quenched, it is ejected into a collection device. A manual air purge can be connected to the second mixer so the complete aged solution is recovered, with no waste of valuable reactants.



### ZERO DEAD-VOLUME MODE

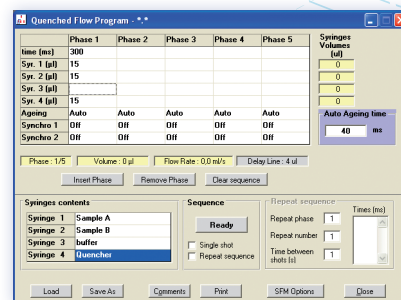
An extra-small volume mode is available when sample volumes less than 250  $\mu\text{l}$  are necessary, when a user has an extremely valuable samples, or only 10-15  $\mu\text{l}$  of solutions to do a single ageing time to catch an intermediate.

The extra-small volume mode uses 10-15  $\mu\text{l}$  of sample for the reaction, plus 10  $\mu\text{l}$  to prime the system. After the reaction is run, the priming component is recovered for future use. The net sample usage is only that amount actually consumed by the reaction. This means zero dead volume, and no wasted samples!

## A user-friendly interface

The **QFM-4000** is controlled from a PC or a laptop using Bio-Kine software and a USB connected mixer control. Bio-Kine is supported by Windows XP, 7, 8 or 10. Bio-Kine software is powerful and comprehensive for the expert user, but also easy for an occasional user to operate. Once injection volumes for each syringe have been entered, the user only needs to indicate the ageing time desired. The duration and speed of the phase are then automatically calculated and adjusted to meet the user's parameters. Syringes are completely independent, so washing phases can be added to sequences before or after mixing steps. **The QFM-4000 has the most user-friendly and user-powerful quench-flow interface on the market.**

With only one parameter to change between experiments, a 20 point kinetics set can be done in less than 10 minutes, with only 220  $\mu\text{l}$  of solutions. **No other system gives you so much control, so easily, and with so little sample.**



## Temperature control

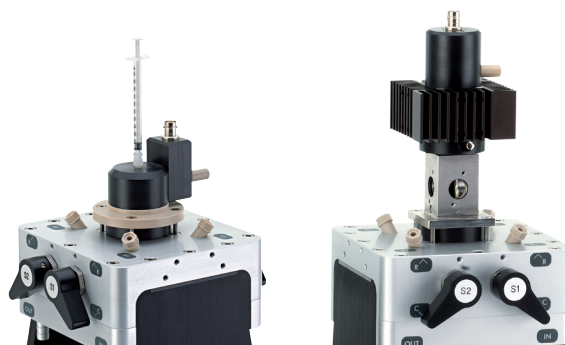
All driving syringes and the mixing chamber can be temperature controlled by connecting a water bath circulator. Individual syringe temperature control is available in case a sample is not stable at the reaction temperature.

This allows a small, user-defined amount to be pre-incubated a few seconds before the experiment. The stock solutions can be stored safely in the driving syringes.

## A modular instrument

**QFM-4000** can easily be customized to match your application. Many stock and semi-custom interfaces are available for various collection and analytical devices. The control software and hardware also have options for synchronizing the system with external devices. Please contact **BioLogic** directly or your local representative to discuss any special customization needs you have. Like all **BioLogic** mixing systems, the **QFM-4000** was designed to offer many upgrade possibilities. It can be converted into a SFM-4000/Q in few minutes, or be upgraded to become a triple mixing stopped-flow instrument (SFM-4000/s).

**QFM-4000** reliability and durability is a major advantage. Built-in driving syringes are made of PEEK, and are user replaceable. They cannot be broken under normal use as glass syringes can be. Materials used in **QFM-4000** are compatible with organic solvents, so the instrument can be used for a wide range of applications from organic chemistry to biochemistry.



SFM-4000/Q

SFM-4000/S

### SPECIFICATIONS

#### Configuration

Number of syringes	4
Number of mixers	2
Ageing line volume	3 µl (factory calibrated)
Storage lines volume	15 µl
Syringe volume	1.9 ml for S1, S2 and S4 3.6 ml for S3
Material in contact with samples	PEEK and PTFE
Duration of flow	Automatic in mixing phase 1 ms to 60 s in washing phase
Synchronization	+/- 5 V TTL pulse
Delay line purge	Air or buffer
Exit line purge	Air

#### Mixing performances

Minimum ageing time	4 ms
Minimum injection volume	10 µl
Dead volume	zero µl in extra-small volume mode
Temperature range	0-70°C

#### General

Power requirements	300 W; 110-220 V; 50/60 Hz
Communication	USB
Software	Bio-Kine
PC configuration	Windows XP, 7, 8 or 10
QFM-4000 weight	16 kg
QFM-4000 dimensions	480 x 180 x 160 mm (H x W x L)
MPS-70 dimensions	150 x 300 x 430 mm (H x W x L)



#### Headquarters

**Bio-Logic SAS**  
1, rue de l'Europe  
38 640 Claix - France  
Phone: +33 476 98 68 31  
Fax: +33 476 98 69 09

[www.bio-logic.net](http://www.bio-logic.net)

#### Affiliate offices

**Bio-Logic USA, LLC**  
P.O.Box 30009 - Knoxville, TN37930 - USA  
Phone: +1 865 769 3800 - Fax: +1 865 769 3801

**Bio-Logic Science Instruments Pvt Ltd**  
304, Orion Business Park, Next to Cine Wonder,  
G. B. Road, Thane(W), 400 607 Mumbai - India