



## Binary Pump Module

High pressure dual reagent delivery module



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# Binary Pump Module™

High Pressure Dual Reagent Delivery Module—just add your reactors!



- Upgrades any FlowSyn continuous flow chemistry system to four-channel operation
- Up to 200 bar maximum pressure and 0.005—50 ml/min per channel
- Comes complete with PC software for stand-alone operation
- Use in combination with individual flow reactor units as the core of a modular flow reactor system

The new Binary Pump Module (BPM™) has been designed to offer the flow chemist maximum flexibility. It may be used either as a **two-channel upgrade** in combination with any FlowSyn system (to give four identical reagent channels in total), or completely independently as a **stand-alone dual reagent delivery module**.

The BPM is solidly engineered using well-established components of proven reliability. It uses latest generation HPLC pump heads modified to offer broad general chemical compatibility. Three Hastelloy® pressure transducers constantly monitor pressure and system performance to ensure safe operation.

The standard unit (**UQ1022**) is fitted with stainless steel tubing, delivers flow rates from 5 µL/min up to 10 mL/min and can operate at up to 100 bar (1400 psi). A 200 bar (2800 psi) version is also available as an option (**UQ1022-200**). The **BPM Maxi (UQ1023)** delivers flow rates of up to 50 mL/min per channel and is limited to 100 bar.

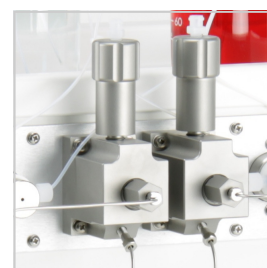
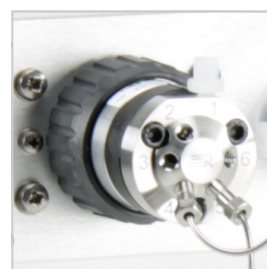
Alternative configurations are available that offer either all perfluoropolymer or all Hastelloy® flow paths. On request, units can even be supplied with flow paths constructed of two different materials (for specific chemical compatibilities) in the same module.

## Features:

- **Integrated in-line mixing module**
- System back pressure regulator and low pressure outlet selection valve (Collect/Waste)
- **Three separate fluidic circuits** - to facilitate pump priming 'on the fly' without the need to cool/depressurise the reactor(s)
- **Robust** - all stainless steel construction.

## Each pumping channel is identical and has:

- A low pressure PTFE/glass inlet reagent/solvent selection valve
- A high pressure chemically resistant injection valve with 1.0 mm fluidic channels
- An in-line pressure transducer and priming port
- Automatic air bubble detection (ABD) algorithm.



As a dual channel reagent delivery system the **Binary Pump Module** offers users the flexibility to build customised *multi-channel* and *multi-reactor* flow chemistry systems that are able to perform multi-step reaction sequences.

## Integrated 4 Channel Flow Reactor Systems

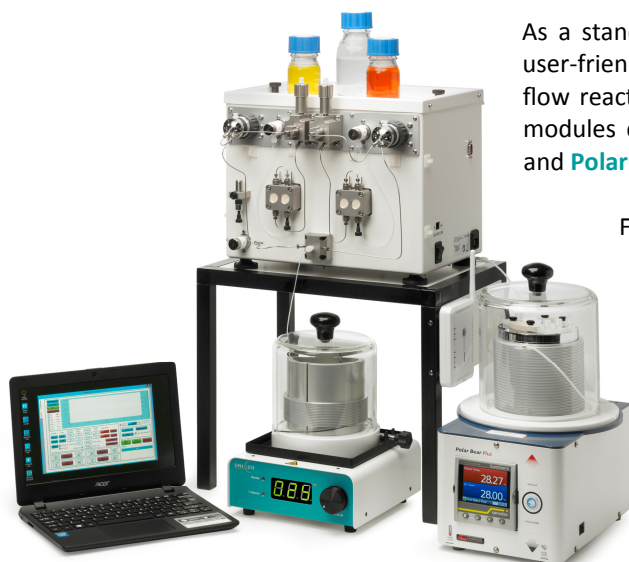
When the **BPM** is connected to a FlowSyn, basic control of the four identical flow channels can be achieved directly through the FlowSyn user interface.

Full automation can be achieved by adding **FlowControl™** system control software. Users can program a sequence of up to 100 individual reactions to run unattended. Moreover, in combination with a liquid handler, sample loops can be filled automatically choosing from a pre-selected sample set, thereby enabling full combinatorial experimentation for either reaction optimisation or compound library production (**Auto-LF™**).

This system can be further upgraded by adding up to 2 additional reactor modules (**HotCoil™** or **Polar Bear Plus Flow™**).



## Modular Flow Reactor Systems



As a stand-alone reagent delivery module, the **BPM** is controlled using user-friendly PC software and can act as a core component for a modular flow reactor system. For performing single experiments up to 4 reactor modules can be added choosing any combination of **HotCoil**, **Cold Coil** and **Polar Bear Plus Flow** units.

For example, the Uniqsis **BPM Maxi** (2 x 50 ml/min) might be combined with a Uniqsis **Cold Coil** to constitute a flow system suitable for low temperature scale-up work in which the reactor temperature is controlled by an external recirculating heater/chiller.

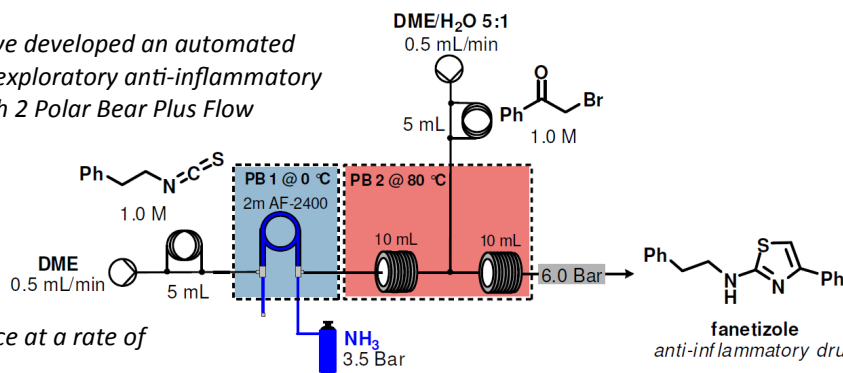
Sequences of reactions can be performed by utilising **FlowControl** system control software which is able to control up to 2 **BPMs** (4 channel system) a fraction collector, and a sampler (to automate the filling of sample loops).

### Case History:

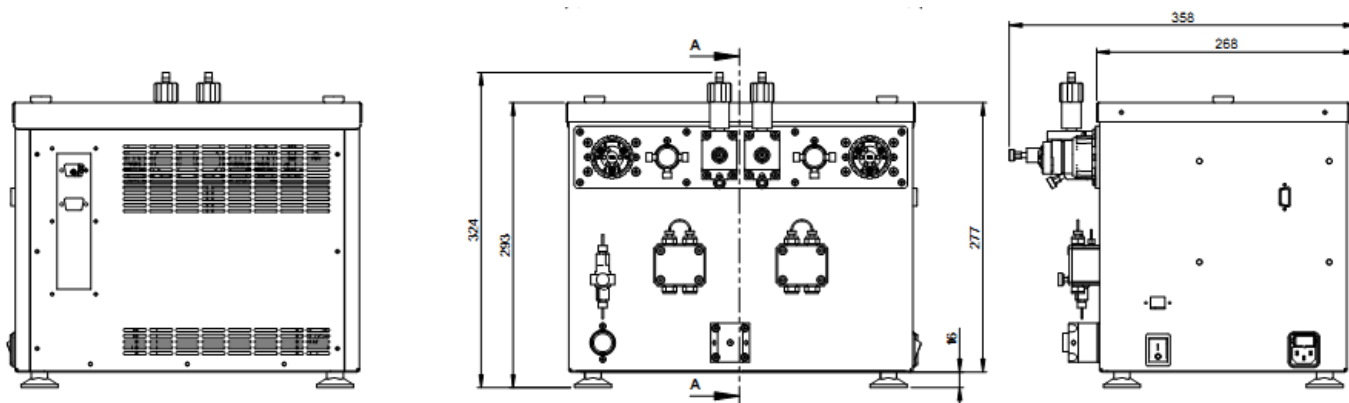
Researchers<sup>1</sup> at Cambridge University have developed an automated continuous flow-through synthesis of the exploratory anti-inflammatory agent Fanetizole by combining a BPM with 2 Polar Bear Plus Flow reactor modules.

A gas-liquid coil reactor was used to deliver ammonia gas into the reactor.

Following isolation by precipitation, this system was able to produce drug substance at a rate of approximately 10g/hour.



1. J. C Pastre, D. L. Browne, M. O'Brien, S. V. Ley, *Org. Proc. Res. Dev.*, 2013; 17, 1183



### UQ1022/UQ1023 Binary Pump Module — Specification

<b>Flow rate (per channel)</b>	0.005 – 10.0 mL/min (UQ1022) 0.05 – 50.0 mL/min (Maxi: UQ1023)
<b>Maximum pressure</b>	1400 psi (100 bar) or 2800 psi (200 bar) - UQ1022 1400 psi (100 bar) - UQ1023
<b>Flow path</b>	316 Stainless steel (PTFE and Hastelloy® available to special order)
<b>Dimensions</b>	360 mm (w) x 260 mm (d) x 300 mm (h)
<b>Power supply</b>	220V 1100VA or 110V 1800VA
<b>Weight</b>	19.2 kg



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