High-Performance Continuous Flow Chemistry Systems

Robust • Accurate • Flexible • Safe

UNIQSIS

Accessible flow chemistry

Flow chemistry systems from Uniqsis

Uniqsis designs and manufactures of a range of bench top continuous flow chemistry systems suitable for a wide range of applications within chemical, materials and pharmaceutical research. Our objective is to make flow chemistry accessible to both novice and experienced users alike.
FlowLab™ is a 2 channel, flow chemistry system that incorporates manual switching valves to afford a cost-effective entry into flow chemistry. FlowLab software provides data logging and real-time reaction monitoring.

FlowLab™

Entry-level flow chemistry system

FlowLab™ *Plus*

Modular flow chemistry system with automated control

FlowSyn™

Integrated flow chemistry synthesis system with automated control

FlowLab™ *Plus* is a modular plug-and-play equivalent of the FlowSyn flow chemistry system with full automated capability that is built around a dual channel reagent delivery module (BPM). It has the capability to control up to 4 reactor modules and a fraction collector, and is compatible with the Auto-LF II Automated sample Loop Filling upgrade and FlowControl II remote control software.

FlowSyn™ is a compact, fully integrated flow reactor that can be operated in either manual or automated modes. FlowSyn can be readily upgraded and the functionality extended to include additional pumps, fraction collectors, liquid handlers, gas-liquid reactors and cryogenic modules. FlowSyn is compatible with FlowControl II remote control software.

FlowLab™ cost-effective flow chemistry systems

Uniqsis FlowLab™ & FlowLab Cold™ entry level flow chemistry systems

FlowLab is an entry-level flow chemistry system that combines up to 3 chemically resistant, high quality HPLC pumps with up to 2 standalone reactor modules selected from the **HotCoil, HotChip** or **Polar Bear *Plus* Flow** and **Polar Bear GSM**.

The components can be controlled individually using their manual interfaces or remotely using simple PC software that also provides real-time data logging and allows experiments to be saved and exported. Manual inlet and outlet selection valves facilitate reagent input and product collection.

The system can be controlled wirelessly to avoid the need to place the computer in the fume cupboard or run cables across the lab.

- Wi-Fi remote control
- Dual high pressure pumps (100 bar[a])
- RT to 260°C[b] temperature range (FlowLab)
- -40°C to 150°C temperature range (FlowLab Cold)
- Complete with 5 ml PTFE and 5 ml 316L stainless steel coil reactors
- User-friendly control software with real-time data logging and archiving of experiments

[a] 200 bar option available; [b] 300°C option available

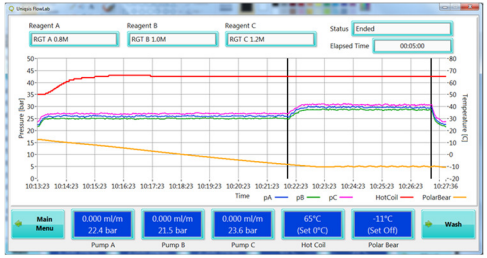
FlowLab™ cost-effective flow chemistry systems

Uniqsis FlowLab Column™

FlowLab Column is designed for experiments using catalysts or supported reagents packed into a stainless steel or glass column. It consists of 2 high pressure pumps in combination with a HotCoil fitted with a HotColumn Adaptor. Column holders are available to accommodate a range of column diameters. Up to 5 additional column holders may be attached and connected together in series for scale-up applications.

- Wi-Fi remote control
- Dual high pressure pumps (100/200 bar)
- RT to 260/300°C temperature range
- Complete with 10mm OD 316L stainless steel column reactor
- Manual inlet and outlet selection valves
- User-friendly control software with real-time data logging and archiving of experiments

Examples of custom FlowLab Systems:



Fully integrated systems for total ease of use

FlowSyn™ & FlowSyn Maxi - a complete system in one box

FlowSyn is a complete dual channel flow reactor system. Two chemically resistant, high pressure pumps operating at up to 100 bar[a] deliver reagents *via* a mixer into electrically heated flow reactor modules. Back pressure regulators prevent back flow and pressurise the system allowing reactions to be superheated up to 260°C[a]. A wide variety of coil, glass chip and column reactors are available and flow paths can be constructed from 316L stainless steel, PTFE or Hastelloy C for maximum chemical compatibility.

FlowSyn can be controlled manually or an experiment can be programmed to run automatically after which the flow path is automatically flushed with clean solvent ready for the next experiment.

The system can be readily upgraded and the functionality extended by adding optional components such as fraction collectors, liquid handlers, gas-liquid reactors, cryogenic modules and additional pumps. Upgrading to FlowSyn Auto-LF allows full combinatorial reaction optimisation or compound library generation. Alternatively, individual reactions can be scaled up using the FlowSyn Maxi to throughputs approaching 100 ml/min.

- Carry out superheated reactions up to +260°C and 100 bar[a]
- Wide range of coil, chip and column reactors available in a variety of materials for optimal chemical compatibility
- Automated, chemically resistant sample injection valves
- Seamlessly scale up reactions up to and 100 ml/min (FlowSyn Maxi)
- Choose flow path from PTFE, 316L stainless steel or Hastelloy C
- Future proof - numerous hardware and software upgrade options available for maximum flexibility

[a] 200 bar and 300°C options available on request

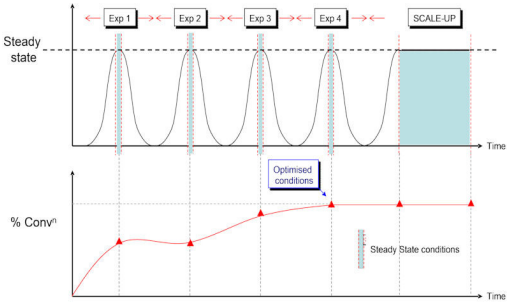
Fully integrated systems for total ease of use

FlowSyn Multi-X™ - automate multiple experiments

A convenient and versatile multi-experiment package for automating a series of reactions, the FlowSyn Multi-X upgrade is ideal for optimising reaction conditions in flow.

Capable of running unattended, it will perform up to 10 sequential experiments and collect the results as discrete fractions or steady state samples ready for off-line analysis.

Efficient, effective and straightforward to use - our most popular system!



- Automatically runs up to 10 sequential experiments
- Vary reaction temperature, residence time and stoichiometry
- Choice of ‘optimisation’ or standard ‘fractionation’ protocols
- Integrated control interface - no need for a separate PC
- Single and 4 rack fraction collector options
- Compact footprint
- Automated sample loop injection valves for compound library synthesis

Fully integrated systems for total ease of use

FlowSyn Auto-LF - 2 or 4 channel system

A fully automated system that efficiently runs combinatorial library or optimisation experiments employing multiple reagent inputs under varying reaction conditions with automatic loading of pre-selected reagent solutions into sample loops prior to the start of each sequential experiment. Simultaneous loop filling and fraction collection saves valuable time, whilst integrated wash steps prevent cross-contamination.

- Automate experiments with multiple combinatorial reagent inputs
- Powerful intuitive PC interface for real-time reaction monitoring and data logging
- Stacked, small format XYZ sampler/fraction collector minimises space requirements
- In-built automated wash protocols
- No unreliable sample injection ports
- Septum-piercing liquid handling ensures reagent solutions are preserved
- Air bubbles prevent sample dispersion when loading sample loops to minimise reagent wastage
- System shown includes optional inline UV/Vis detector

Modular systems for total flexibility

Uniqsis Binary Pump (Reagent Delivery) Module

If you need complete flexibility and/or prefer to build your own continuous flow chemistry system from scratch, then Uniqsis can help.

Much more than a 2-channel pumping system the Uniqsis Binary Pump Module (BPM) is equipped with inlet/outlet selection valves, 3 in-built pressure transducers and high pressure sample injection valves compatible with a wide range of sample loop sizes. The BPM may be used as a full function 2-channel upgrade to convert the FlowSyn to 4 -channel operation, or as a stand-alone two-channel reagent delivery system and control hub for a bespoke continuous flow system (FlowLab Plus). Simply add a PC-based control program and your choice of reactor modules.

The BPM, is compatible with a wide range of add-on modules (reactors, frac autosamplers, inline UV/Vis detector etc) to enable you to create a complete fl according to your application needs.

Two BPMs may be combined to constitute a 4-channel system.

- Dual high pressure pumps (100 bar[a])
- All stainless/HC steel high pressure components
- Chemically resistant sample injection valves
- 3 Hastelloy/ceramic pressure transducers as standard
- PTFE or Hastelloy® flow path options
- Chemically resistant back pressure regulators
- Integrated mixer and back pressure regulator
- Dedicated user-friendly control software compatible with Uniqsis modular reactors

Modular components

Heating

Uniqsis offers several modular heating options - the HotCoil™ coil heater for heating only, the Polar Bear *Plus* Flow™ and FlowSyn Cold Coil™ for both cooling and heating, and the Polar Bear™ for cooling only.

HotChip™: Standalone Heater for Glass Static Mixers (230°C)

Low cost heated 'chip' reactor module that can be used in standalone mode in combination with your own pumps or remotely controlled using the FlowSyn or BPM dual reagent solution addition module.

- Single 'push-to-set' rotary controller
- Compatible with 1x large or 2x small Uniqsis Glass Static Mixers (GSMs)
- Large bright display with visual heat-up and cool-down indicators
- Optional external temperature sensor (inserts directly into heating block)

HotCoil™: Standalone Coil Heater (300°C)

Low cost heated 'chip' reactor module that can be used in standalone mode in combination with your own pumps or remotely controlled using the FlowSyn or BPM dual reagent solution addition module.

- Single 'push-to-set' rotary controller
- Optional automatic compressed air cool-down upgrade available
- Compatible with all FlowSyn coil reactors
- Large bright display with visual heat-up and cool-down indicators
- Increases reactor capacity for easy scale-up

Modular components

Heating and Cooling

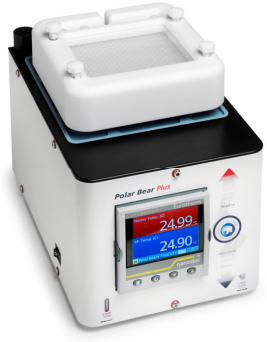
Uniqsis offers several modular reactors that in addition to heating also incorporate active cooling.

Polar Bear *Plus* Flow™ (-40°C to +150°C)

A state-of-the-art heating and cooling reactor module for flow chemistry applications, the Polar Bear *Plus* Flow is completely self-contained and very easy to use. No need for card-ice, refrigerants or heat transfer fluids.

- Compact and portable - can easily be relocated in and out of fume cupboards
- A nitrogen purge can be connected to prevent 'icing-up'
- Compatible with all Uniqsis FlowSyn coil reactors
- Optional glass mixer chip holder available (as shown)

Polar Bear GSM (-30°C to +230°C)



No need for card-ice or liquid nitrogen, just plug in and switch on. The Polar Bear GSM 'chip' heating and cooling reactor module may be controlled using the FlowSyn or Binary Pump Module, or used in standalone mode in combination with your own pumps.

- Static or programmable temperature gradients
- Compatible with 2x small or 1x large Uniqsis glass mixer/reactor chips
- Ethernet LAN remote control port
- Insulated cover with glass view window

Modular components

Heating and Cooling

Polar Bear™ High Performance Chiller Unit (ambient to -88°C)

Developed in a collaboration between Cambridge University, UK and Cambridge Reactor Design the Polar Bear standalone chiller unit delivers efficient cooling down to -88°C without the need for solid CO_2, or liquid nitrogen.

- Dedicated cryogenic reactor module for flow chemistry applications
- Fast, precise cooling without the need for card-ice, liquid nitrogen or heat transfer fluids
- Compatible with all Uniqsis coil reactors
- Reactor can accommodate multiple coils to allow pre-cooling of reagent solutions prior to mixing
- Maximum coil reactor volume 60 ml

Cold Coil II™ (-70°C to 150°C)

In combination with a suitable existing recirculator and a FlowSyn or Binary Pump Module, this standalone module can control reactions between -70°C and +150°C. The external circulator can be controlled directly using the FlowSyn if required.

- Integral probe for precise temperature monitoring
- Compatible with all Uniqsis coil reactors
- Compatible with Uniqsis glass static mixers (with optional adaptor, not shown)
- Compatible with Uniqsis PhotoSyn™ LED photoflow reactor
- Patented coil reactor clamping mechanism for optimal thermal contact

Modular components

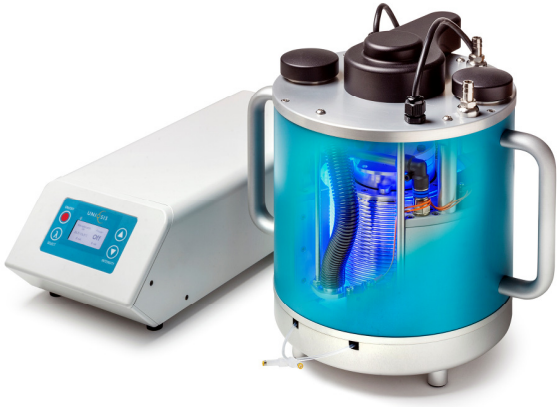
Flow Photochemistry

PhotoSyn™ High Power Photoflow Reactor

The Uniqsis PhotoSyn has been designed to provide scientists with a high power LED light source for continuous flow applications. Available with a selection of different LED arrays the unit can provide outputs up to 700W from the dedicated programmable power supply.

Customised units (e.g. 385nm, 420nm) are available on request.

The PhotoSyn is compatible with the Uniqsis Cold Coil (shown fitted opposite) and Polar Bear *Plus* Flow reactor modules.



- 365nm, 455nm, 550nm and HP ‘white’ LED light options
- Independent external temperature control of coil reactor
- Reflective chromed coil reactor mandrels
- Long lifetime, water-cooled, curved LED arrays concentrate light onto the central coil reactor.
- Maximum PFA/FEP coil reactor volume 50 ml
- Safety interlocks prevent light leakage when operating

Modular components

Flow Electrochemistry

Ammonite 8™ Electrochemical Flow Cell

The Ammonite 8 is a compact electrochemical flow cell that is compatible with Uniqsis FlowSyn and FlowLab flow chemistry pumping systems.

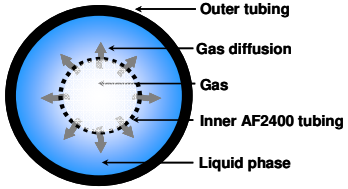
The Ammonite family of electrolysis cells are designed to make electrosynthesis a routine and user friendly procedure. The unique cell design permits reproducible selective chemical change with a high conversion.
Synthesis is achieved in a single pass of reactant through the microflow electrolysis cell despite a short residence time.

- Suitable for flow rates up to 5 ml/min
- The cells are suitable for electrosynthesis using solutions with only a low electrolyte solution
- High selectivity demonstrated in a variety of electrosyntheses
- High single pass conversion for enhanced throughput
- Spiral flow path engineered to maximise pathlength/size ratio
- Wide range of electrode materials available
- Throughput of several grams per hour is possible
- Larger scale Ammonite15 also available.

Gas-liquid flow chemistry

Tube-in-tube Gas Addition Modules

Tube-in-tube gas-liquid reactors provide a safe and efficient means of performing gas-liquid reactions under continuous flow conditions. They utilise a gas-permeable fluoropolymer inner tubing through which a wide range of gases can rapidly diffuse into the surrounding liquid phase.



GAM I Pre-saturation Module

Although designed primarily as a module to provide a solvent feed that is pre-saturated with gas, the GAM I can be used a ambient temperature as a flow reactor. It has an integrated gas management manifold.

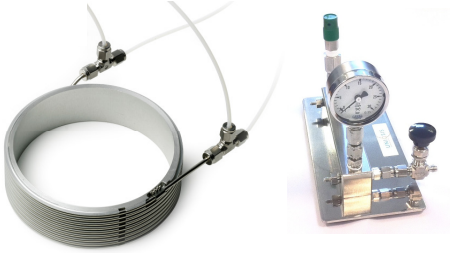
GAM II Coil Reactor

In the GAM II, the tube-in-tube concept is incorporated into a standard Uniqsis coil reactor. This can be either heated or cooled, and gas is now supplied 'on-demand' directly to the reaction mixture to improve throughput.
The outer tubing is stainless steel for safety and to ensure optimal heat transfer.

To facilitate gas management, an optional Gas Manifold is also available.

- Safely and reproducibly perform gas-liquid reactions in flow.
- Perform gas-liquid reactions at elevated or sub-ambient temperatures.
- Economical use of expensive gases.
- Compatible with FlowSyn, Cold Coil and Polar Bear *Plus* Flow.

Gas Addition Module GAM I



Gas Addition Module GAM II
with optional Gas Manifold

Accessories & consumables

Reactor modules — coil and column reactors

Coil reactors

Uniqsis coil reactors are compatible with the FlowSyn, HotCoil, Cold Coil II and Polar Bear *Plus*. All coils are designed for quick and easy change-over utilising a proprietary clamping mechanism, and the tubing can easily be removed and re-wound in the event of a blockage.

For optimum mixing and temperature control, combine with a glass static mixer block/chip for reagent pre-heating and pre-mixing.

- Wide range of sizes up to 60 ml for mg to kg reactions
- Range of tube materials (1/16” and 1/8” OD in PFA, PTFE, SS, Hastelloy®, copper) for optimal chemical compatibility

Column reactors

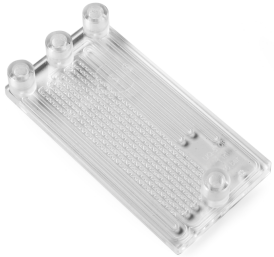
The FlowSyn column heater accepts standard 10mm ID x 100mm glass columns with adjustable end fittings, and adapts for columns of different sizes. Users can choose which reagents, catalysts and/or scavengers to pack into the columns.

- Adjustable column length for varying reaction scale and minimal dead volume
- Easy interchange of columns
- 316L Stainless steel column options available
- Glass columns can be heated up to 150°C

Accessories & consumables

Reactor modules — chip reactors

Glass static mixer reactor blocks (GSMs)



The Uniqsis 2- and 3-channel borosilicate glass mixer block/chip reactor is designed for high throughput applications, fast mixing-dependent reactions and fast, highly exothermic reactions requiring temperature control.

For heating and cooling, the mixer block can be mounted on the FlowSyn column module, the FlowSyn Cold Coil reactor module, or the Polar Bear *Plus* Flow™.

- Rapid, efficient temperature-controlled mixing
- Choice of A + B or (A + B) + C static mixer geometries
- Simple finger-tight screw connections

HotColumn™ Adaptor

Coil-to-column reactor convertor

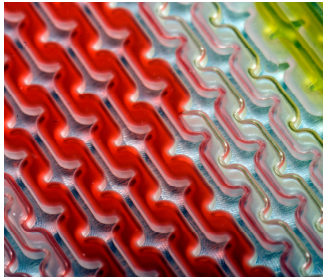
The HotColumn Adaptor converts any Uniqsis coil reactor module into a multi-position column reactor.

- Fits 10, 15 and 20 mm OD glass columns
- Adaptor accommodates up to 6 column holders
- Insulated column holders with glass viewing window
- Optional external temperature sensor for precise thermal control
- Adaptor plate allows HotColumn holders to be fitted to FlowSyn

Accessories & consumables

Reactor modules — chip reactors/mixers

Glass static mixer reactor blocks (GSMs)



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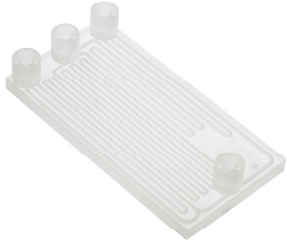
For heating and cooling, the mixer block can be mounted on the FlowSyn column module, the FlowSyn Cold Coil reactor module, or the Polar Bear *Plus* Flow.

- Rapid, efficient temperature-controlled mixing
- 2D or 3D chicane mixing geometries
- Choice of A + B or (A + B) + C static mixer geometries
- Simple finger-tight screw connections

2 input 1.6ml [A+B] GSM

2 input 20ml [A+B] GSM

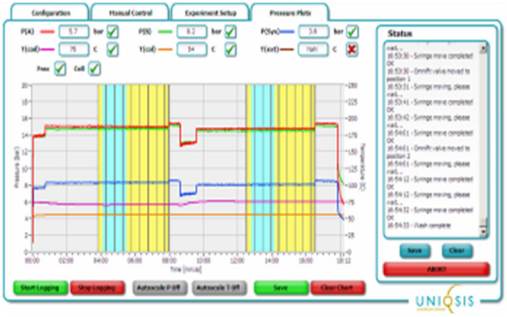
2 input 0.5ml [A+B] GSM



3 input 1.0ml [A+B]+C GSM

Accessories & consumables

Software



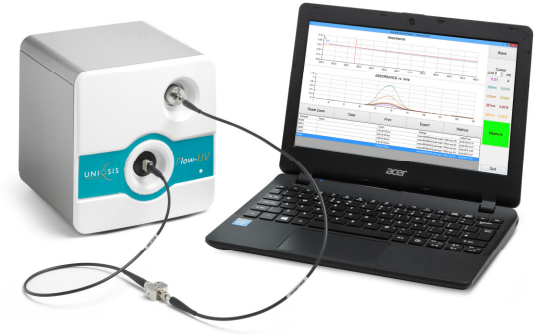
Real-time data logging package

Uniqsis have developed an invaluable auxiliary PC package for use with the FlowSyn that allows full real-time data-logging of system and pump pressures, and reactor temperatures.

The easy-to-use software is also able to display fractionation data when a fraction collector is attached (Multi-X) and the pressure and temperature data can be saved to a log file and exported.

Simple and extremely useful - highly recommended!

Flow-UV



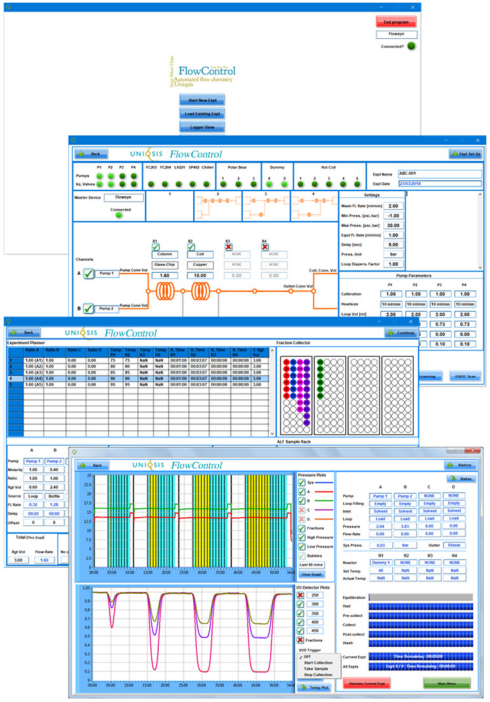
In-line UV-VIS Spectrophotometer

Flow-UV™ is an affordable in-line UV-Vis detector for flow chemistry applications. The flow cell utilises transparent PFA reactor tubing. Dispersion and steady state may be monitored in real time to assist with product collection and quality control.

- 220-1050nm long lifetime, pulsed Xenon source
- Full spectrum or multiple fixed wavelength modes
- Solid state UV enhanced 3648 pixel CCD array
- High pressure flow cell may be positioned anywhere inline
- Monitor dispersion and steady state in real time
- Ideal for UV-directed product/fraction collection!

Remote Control Software

FlowControl II™ multi-channel automated flow chemistry



FlowControl II is a powerful new application that allows the FlowSyn and all add-on modules to be programmed and operated remotely from a computer.

Based upon the existing FlowSyn control interface, FlowControl II is both intuitive and straightforward to use, but adds a more versatile experiment planner, a data-logging module, a data analysis facility, a reporting function and a remote manual control option.

Key features include:

- Create new experiments or reload and/or modify existing saved methods
- Control up to 4 flow channels (FlowSyn + BPM or standalone pumps)
- Control up to 4 reactors (coils, chips, columns, sub-ambient reactors)
- Program up to 100 independent experiments with individual fraction/product collection protocols
- Automated robotic filling of up to 4 sample loops (Auto-LF4)
- Integrate the Flow-UV to automate product collection
- Real time data logging, archiving and data export into Excel etc.
- Edit experiments ‘on-the-fly’, skip or pause the current experiment
- Analyse and manipulate saved data whilst simultaneously running other experiments
- Remote Wi-Fi control and data logging from your office using a dedicated wireless router.

More information

For more detailed information of our products, their specification and application, please visit our website or contact us. We will be happy to discuss your application and give advice.

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