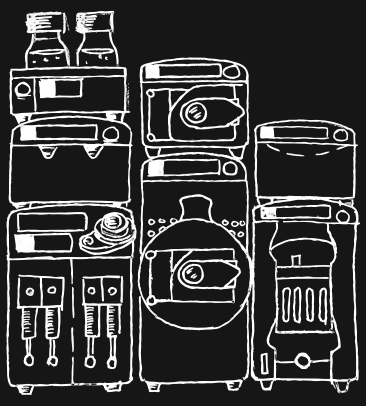
Asia

SYRRIS
Asia

Product information



Award-winning flow chemistry solutions

Asia Flow Chemistry System

Asia is the award-winning flow chemistry range from Syrris. Designed by chemists for chemists, it enables the widest variety of chemical reactions with ultimate ease of use.

Chemists have complete control with Asia. Run manual or automated experiments, with production scales of mg to kg, with a range of temperatures, pressures, and reaction times to suit your needs.

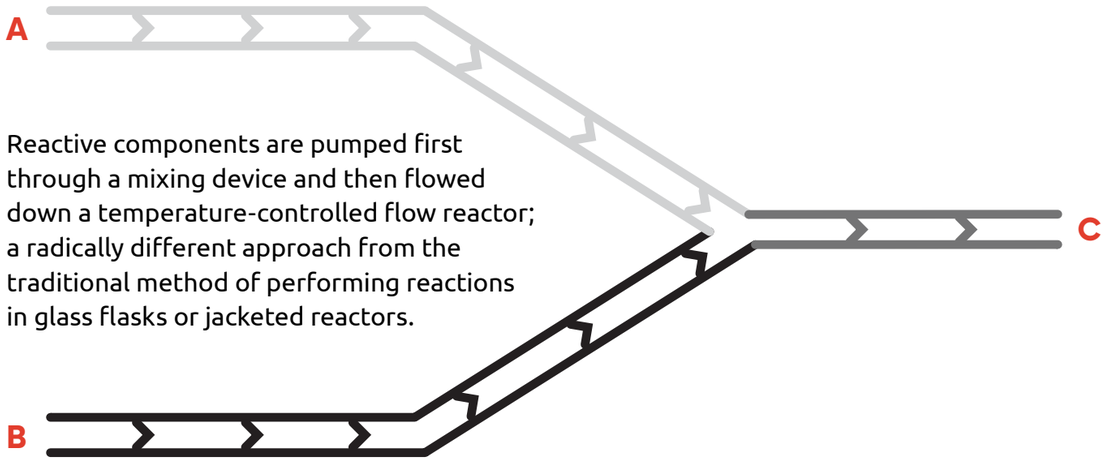
With all wetted materials offering maximum chemical resistance, you'll receive years of continuous service.

Asia received an R&D 100 Award in recognition of advanced functionalities, ease of use, and applicability to a wide range of chemistries.

syrris.com/asia

What is flow chemistry?

Flow chemistry is the process of performing chemical reactions in a tube, capillary, or micro structured device (a flow reactor).



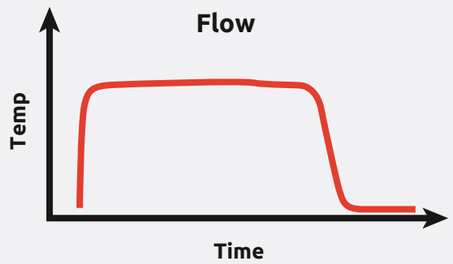
Reactive components are pumped first through a mixing device and then flowed down a temperature-controlled flow reactor; a radically different approach from the traditional method of performing reactions in glass flasks or jacketed reactors.

Flow rate, residence time, reactor volume, and production rate

In a flow reactor, the residence time (i.e. the amount of time that the reaction is heated or cooled) is calculated from the volume of the reactor and the flow rate through it. Asia offers reaction times from a few seconds to a few hours. **Residence time can be varied by changing the reactor volume and/or the flow rates.**

Temperature control

The surface area to volume ratio of the reaction mixture in a Syrris flow reactor is much greater than a round-bottom flask. Thus, heat can be transferred to or from the reaction mixture much more rapidly than in a batch reactor. Greater temperature control can, therefore, be maintained for exo- or endothermic reactions improving consistency and yield.



Benefits of flow chemistry

The minituarized nature of lab-scale flow chemistry systems enable far greater control over reaction parameters, including temperature, residence times, molar ratios, and pressure. The combination of this advanced control leads to 9 main benefits of continuous flow chemistry.

TOP 9 BENEFITS OF CONTINUOUS FLOW CHEMISTRY

Read more at **syrris.com/why-flow**

Faster reactions

It is much easier to pressurize flow chemistry systems than batch chemistry systems. Higher pressures enable higher temperatures, resulting in faster reaction rates (according to the Arrhenius equation).

Safer reactions

Flow reactions are safer because the quantity of reaction occurring at any one time is minimized. Reactions occur as small amounts of liquids are mixed through small reactors, whereas in a batch reactor, the entire reactor contents are mixed at once.

Faster reaction optimization

In a continuous flow chemistry reactor it is extremely easy to vary the reaction time, reaction temperature, ratio of reagents and concentration, resulting in much faster reaction optimization.

Fast serial library synthesis

Flow chemistry systems enable fast, serial library synthesis and purification of 10s to 100s of compounds a day with total automation of liquid handling through the use of automated reagent addition and product collection modules.

Access unique reaction conditions

With flow chemistry, chemists can access novel chemistries not previously possible with traditional batch methods. Chemists can create reactive intermediates and hazardous reagents on demand and react them with no isolation.

Reactions are more selective

Poor selectivity in chemistry stems from variations in temperature, reaction time, and addition/stirring rates. Flow chemistry systems enable much better control and selectivity through excellent temperature control and minimal concentration gradient.

Scale-up is easier in flow than batch

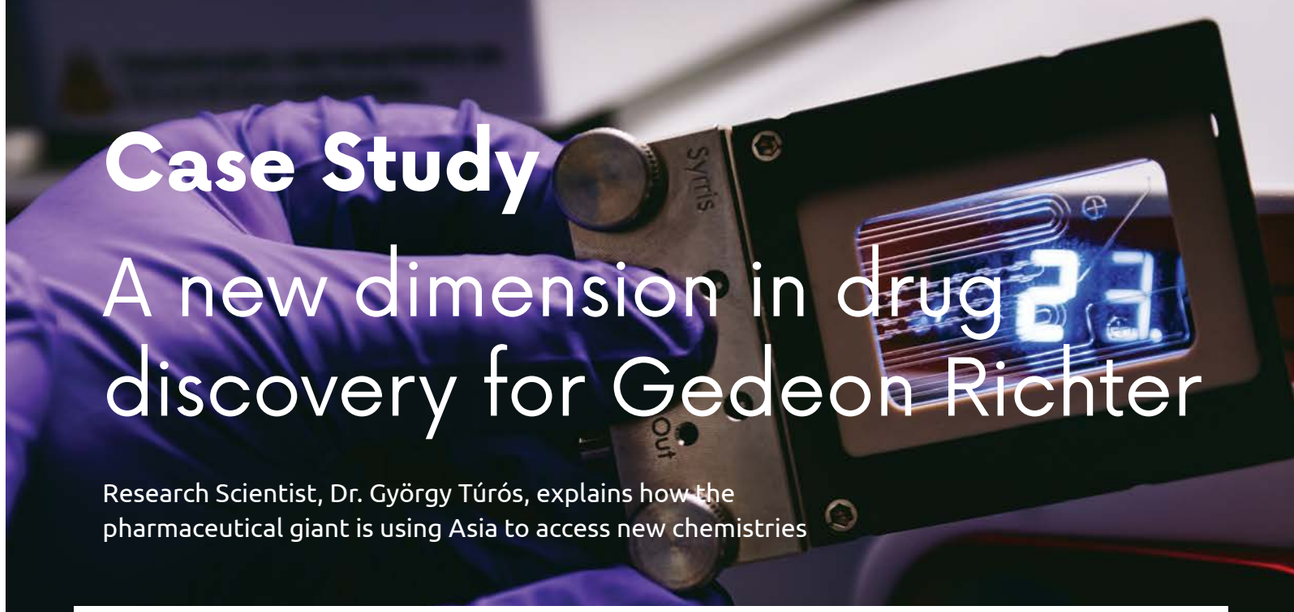
Scaling up from lab scale batch chemistry can be a difficult process. Scaling up in flow is easy. Using the same conditions used to optimize the reaction, chemists can simply flow the reaction for longer to create more material. Scaling up of flow reactors with increased flow rates can afford even more.

Reaction analysis integration

With batch reactions chemists are required to sample multiple times to analyze their reaction. In flow, the chemist can analyze their reaction continuously (IR, Raman, UV, NMR) with a single probe, while sampling and diluting modules allow a reaction aliquot to be diverted to external analytical devices (HPLC, LCMS, etc.).

Reactions are easier to work-up

Traditional batch chemistry relies on a separate operation to perform a work-up, but in continuous flow chemistry, the reaction is already mobile. This enables in-line work-up of liquid-liquid extraction and solid phase reagents/scavengers/filtration.



Case Study

A new dimension in drug discovery for Gedeon Richter

Research Scientist, Dr. György Túrós, explains how the pharmaceutical giant is using Asia to access new chemistries

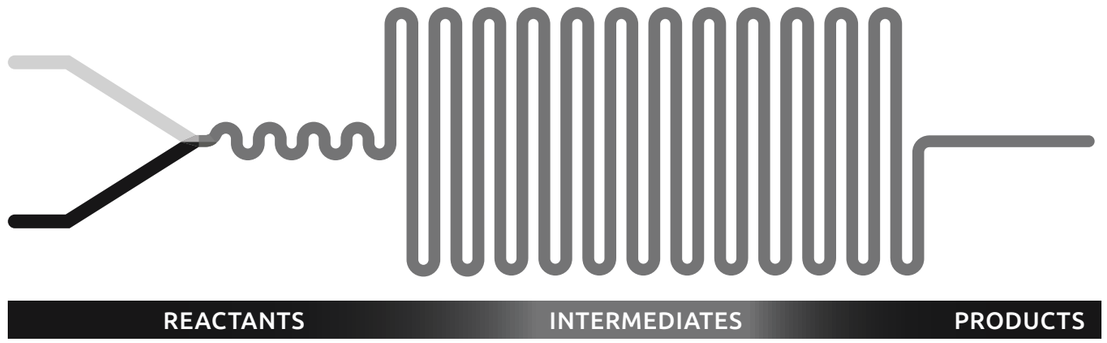
The Discovery Chemistry Department at Gedeon Richter in Budapest, Hungary, invested in an Asia flow chemistry system to aid researchers involved in the design and synthesis of original CNS drugs. Research scientist Dr. György Túrós explained:

“In discovery chemistry research, we need to perform a lot of very interesting and complex chemical syntheses and, until now, have relied on classical batch chemistry methods.

“We purchased an Asia flow chemistry reactor in June 2012, and are reaping the benefits of using flow chemistry techniques. The system has extended the range of chemistries available to us, allowing us to work at much higher pressures and temperatures—sometimes above a solvent’s boiling point—to create completely new heterocyclic scaffolds.

“We can combine the Asia modules in a variety of different ways to meet changing needs, and will also be able to add additional modules at a later date if required. This was an important consideration, and one of the main reasons for choosing Asia.

“Syrris has been very supportive, giving us some valuable ideas and flow chemistry tips during our training, and we can now do chemistry which was absolutely impossible before. In my opinion, Syrris is as innovative in the synthetic chemistry arena as Google or Apple in the informatics field.”



Systems

Starter System

The Asia Starter System is ideal for both industrial and academic chemists eager to begin introducing flow chemistry into their research.

The easy-to-use and affordable Starter System contains all essential flow system modules: an Asia Syringe Pump, an Asia Chip Climate Controller, a glass microreactor, and an Asia Pressure Controller. The Starter Systems is future-proof and can be seamlessly upgraded with additional features and modules as the user's experience with flow chemistry grows.

Electrochemistry System

Electrochemical activation of chemical reagents enables selectivity and transformations impossible by other techniques. Asia gives easy access to electrochemical synthesis methods.

The Asia Flux module and cell offers a wide range of electrodes assembled without the need for tools. The unique design allows the precise control of electron transfer into the process. Users can operate in either constant current (Galvanostatic) mode or constant voltage (Potentiostatic) mode to achieve reductions and oxidations.

Discovery Chemistry System

The Asia Discovery Chemistry System gives the modern discovery laboratory a new toolbox to enable faster and more efficient research.

This system offers easily configured flow experiments capable of running a wide range of chemistries. Users can design a list of experiments, each requiring just hundreds of microliters of reagents, and run them in sequence. This system is ideal for the creation of targeted compound arrays and for efficient reaction optimization for scale-up.

Process Optimization System

Ideal for exploring the conversion of a batch process to a flow process and varying reaction parameters to optimize the reaction conditions.

Easy setup of tens of automated reactions using the intuitive Asia Manager Software. The set-up enables rapid and efficient reaction optimization exploring both continuous reaction parameters (time, temperature, molar ratios) and also the screening of discontinuous parameters such as reagents, catalysts, and enzymes.

Cold System

The Asia Cold System has been defined to enable safe chemical reactions under cryogenic conditions (e.g. exothermic organometallic reactions).

The Asia Cold System incorporates all the required modules for running reactions in continuous flow at temperatures down to -100 °C. The advanced system centers on the Cryo Controller module, delivering temperatures down to -100 °C using only electrical power without the need for external cooling.

Nanoparticle System

Flow chemistry offers exceptional advantages for nanoparticle synthesis resulting in narrow particle size distribution and control over shape and architecture.

The Nanoparticle System offers fast and reproducible mixing, excellent heat transfer, and accurate temperature control. The ability to isolate the nucleation and particle growth is key to harnessing the advantages of flow for these applications giving unique size, shape, and architecture. The Nanoparticle System is ideal for the rapid optimization and production of nanoparticles.

Scale-Up System

Flow chemistry offers an easy and efficient way for scaling up reactions.

Flow reaction parameters can be optimized using a small microreactor on a few milligrams before moving onto a large tube reactor system for synthesizing multi-gram quantities of products. The Scale-Up System enables exploratory reactions to be performed and optimized, taking these optimized conditions the chemist can easily move to a manufacturing amount, even producing kgs per day on the same system, with minimal setup changes.

Premium System

Ideal for chemists who are interested in the utmost functionality and the widest range of flow chemistry applications.

The Asia Premium System provides the full range of Asia modules and enables standard flow chemistry operations (reaction optimization, scale-up, etc.) as well as advanced use (electrochemistry, multi-step reactions, cryogenic reactions, etc.). This exhaustive system includes the benefits of all the other systems, including full automation of experiments for walk-away use.

Modules

Pressurized Input Store

Pressurizes four bottles with an inert gas enabling the use of air sensitive reagents and eliminates cavitation when pumping. **Input pressure 1 to 10 bar, output pressure 1 bar**

Heater and Chip

This module has adaptors that can be changed in seconds to heat the full Asia range of reactors. **Temperature range: room temperature to 250 °C**

FLLEX

Flow Liquid-Liquid EXtraction (FLLEX) offers continuous flow aqueous work up. FLLEX can be used anywhere within the flow setup. **Internal volume: 100 µL**

Automated Reagent Injector

Allows automated aspiration and loading of multiple reagents into injection loops under inert conditions and subsequent pressurization prior to injection. A range of removable racks give a range of usable vial sizes. Ideal for rapid reaction optimization

Chip Climate Controller

Enables glass microreactors to be cooled or heated from **-15 °C to +150 °C**. No need for circulator or cold water supply

Reagent Injector

Chemically resistant manually filled injection valves allow partial or full loops volume to be injected into the reaction. Provides the possibility to switch the valves independently or simultaneously with manual or full automation control. Sample loop sizes of 0.1 mL, 1 mL, 5 mL and 10 mL available

Pressure Controller

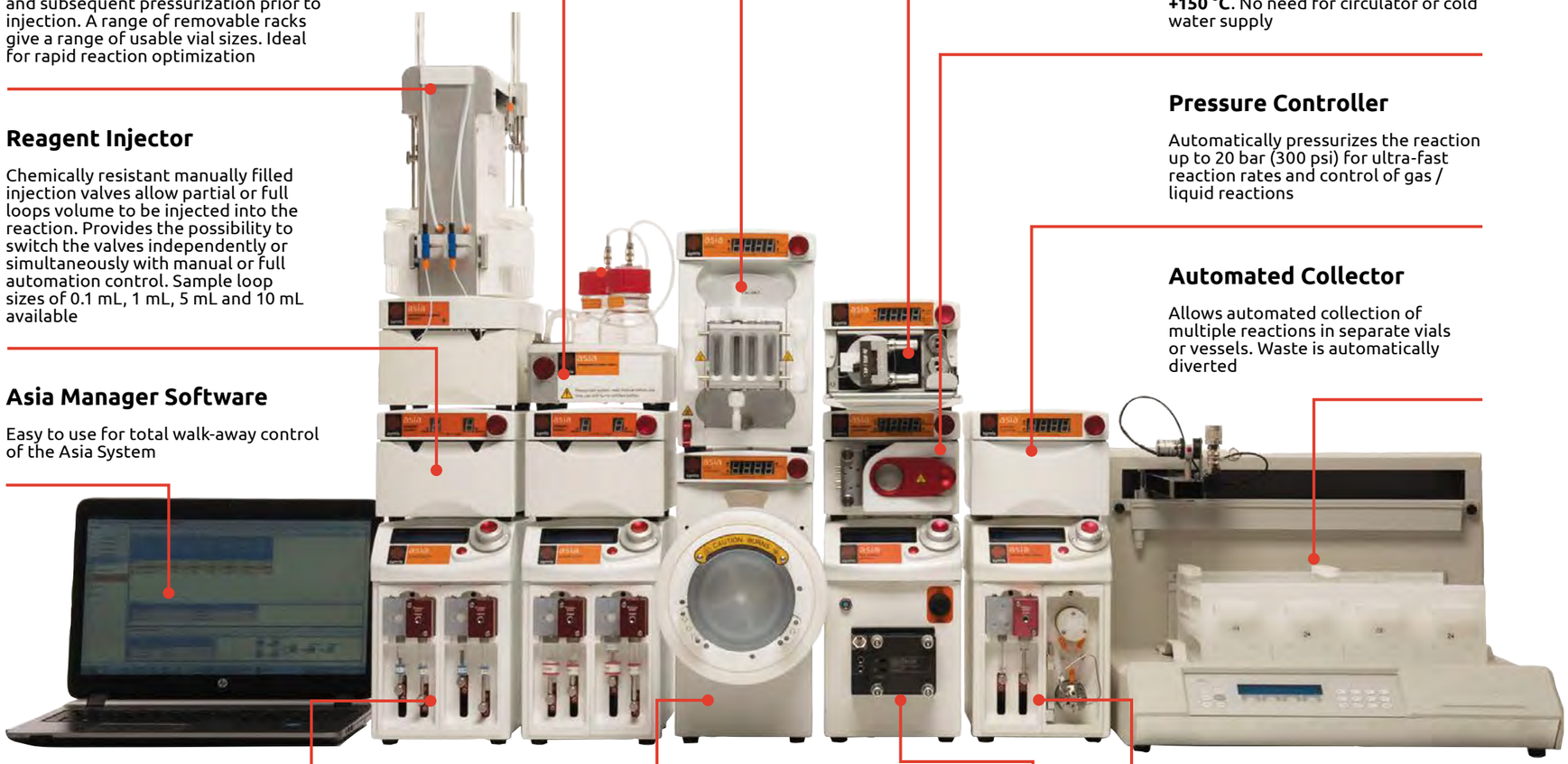
Automatically pressurizes the reaction up to 20 bar (300 psi) for ultra-fast reaction rates and control of gas / liquid reactions

Automated Collector

Allows automated collection of multiple reactions in separate vials or vessels. Waste is automatically diverted

Asia Manager Software

Easy to use for total walk-away control of the Asia System



Syringe Pump

Extremely chemically resistant continuous flow pumps for ultra smooth flow. **Flow rate from 1 µL/min to 10 mL/min each channel. Maximum pressure: 20 bar**

Cryo Controller

Rapidly cool a selection of fluoropolymer or stainless steel tube reactors to -70 °C, or a range of glass or quartz microreactors to -100 °C. Requires only mains power; no need for cryogenic media

FLUX—Flow Electrochemistry

Enables a wide range of electrode materials to be changed in seconds, tool-free. Includes a power supply and electrochemical flow cell with minimal electrode gap. **Internal reaction volume: 225 µL**

Sampler and Dilutor

Enables on-line reaction analysis by automated sample extraction, dilution and transfer to an analytical system e.g. LCMS or UPLC. **Dilution factor: 5 to 250**

The basics of a flow system

Flow chemistry systems can be as simple—or as advanced—as your chemistry requires. All flow chemistry systems require 3 modules; a pump, a reactor (e.g. glass microreactor or tube reactor), and a pressure controller.

Beyond these three essential components, you can build your flow system to your exact requirements. Easily add additional modules including heating/cooling, pressure controllers, automated or manual reagent injectors, electrochemistry, and many more.

Syringe Pump

Pumps are potentially the most important part of a flow chemistry system. Without confidence in pumping accuracy and performance many of the advantages of flow chemistry are lost

Microreactor

Flow chemistry reactors need to be as versatile as possible to cover the greatest range of reaction conditions. Reactors should be flexible in volume to allow a large range of residence times, provide excellent mixing/heat transfer, offer good visibility where possible, and offer the greatest chemical compatibility for the widest range of chemistry

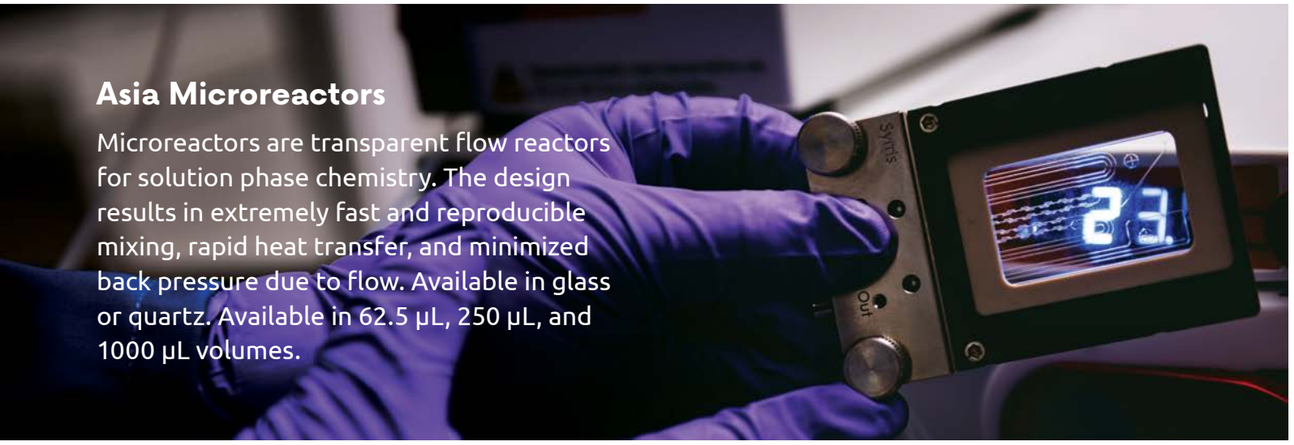
Pressure

The ability to apply high pressures to a flow chemistry reaction is a major benefit. Pressure allows superheating of the reaction mixture above reflux limitations, and allows control of gas reactions, whether introducing gas or where gas is evolved

Flow chemistry reactors

Asia offers a range of reactors, depending on your chemistry. These include glass microreactors, tube reactors, and solid phase column reactors in a range of configurations and sizes.

Highly chemically compatible, Asia reactors are optimized for heat and mass transfer, allowing for the greatest flexibility when designing a flow chemistry experiment.



Asia Microreactors

Microreactors are transparent flow reactors for solution phase chemistry. The design results in extremely fast and reproducible mixing, rapid heat transfer, and minimized back pressure due to flow. Available in glass or quartz. Available in 62.5 µL, 250 µL, and 1000 µL volumes.

Asia Tube Reactors

The Asia Tube Reactors are large volume microfluidic reactors designed for preparative scale solution phase chemistry. The tube reactor contains a long length tube giving larger volumes than glass microreactors and therefore allows higher flow rates for a given residence/reaction time. Available in 4 mL or 16 mL volumes.

Asia Column Reactors

Asia Column Reactors allow the use of solid phase chemistry such as heterogeneous catalysts, solid-supported reagents, or scavengers. The columns can be heated by mounting on the Asia Heater using the Solid Phase Adaptor. There are 4 different diameter columns offering a wide range of volumes. Optional adjustable ends allow columns to be filled with the exact amount required. Available in 0.7, 2.4, 5.6, and 12 mL volumes.

Asia Syringe Pump

The pump is the heart of any flow chemistry set-up, so smooth and accurate flow is essential to reap the various benefits continuous flow offers.

Designed specifically for flow chemistry applications the Asia Syringe Pump provides ultra-smooth flow rates of 1.0 µL to 10 mL/min, pressures up to 20 bar (300 psi), and is constructed from extremely chemically resistant materials. Providing ultimate ease of use, the valves, pressure sensors, and syringes can all be unclipped / unscrewed in seconds without the need for tools.

The Asia Syringe Pump offers two independent flow channels each with an integrated pressure sensor and is controlled by the intuitive front panel's twist and click control knob with screen (enabling it to be used with your existing lab equipment) or by the Asia Manager PC software.

Compared with peristaltic and HPLC-like pumps, the Asia Syringe Pump is practically pulseless which is essential for pumping at all flow rates. The pumping operation produces very low vacuums when aspirating, allowing the use of low vapor pressure and low boiling point solvents which are problematic with HPLC-like pumps.

A selection of syringe sizes allows the widest dynamic flow rate range of 1 µL to 10 mL/min per channel and provides the widest range of residence times on the market.

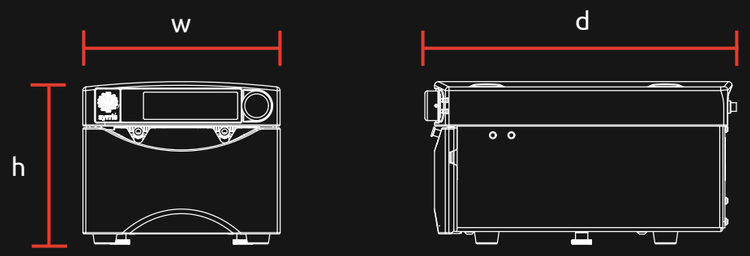
Specifications

	Flow rate	1 µL/min to 10 mL/min per pump channel
	Temp. range	-100 to 250 °C
	Pressure range	Up to 20 bar
	Reactor volumes	Microreactors: 62.5 µL, 250 µL, and 1000 µL Tube Reactors: 4 mL or 16 mL Column Reactors: 0.7, 2.4, 5.6, and 12 mL

Dimensions

	h (mm)	w (mm)	d (mm)
Asia Manager PC Software	N/A	N/A	N/A
Automated Reagent Injector	505	160	300
Automated Collector	270	470	300
Chip Climate Controller	130	160	310
Cryo Controller	335	160	455*
FLLEX	130	160	280
FLUX	257	160	495
Heater	255	160	260
Pressurized Input Store	220	160	255
Pressure Controller	130	160	275
Reagent Injector	130	160	260
Sampler and Dilutor	260	160	270
Syringe Pump	260	160	260

* Not including measurement of reactor. Dimension will depend on choice of reactor.



Systems

* Depending on the syringe size.
** 10 bar when using fluoropolymer tube reactors.
^ Depending on cooling solution.

	Starter		Electrochemistry		Discovery		Process Optimization	
	Regular	Advanced	Regular	Advanced	Regular	Advanced	Regular	Advanced
Flow rate	1.0 µL/min to 10 mL/min*		1.0 µL/min to 10 mL/min*		1.0 µL/min to 10 mL/min*		1.0 µL/min to 10 mL/min*	
Pressure (bar)	0 to 20 bar	0 to 20 bar**	0 to 5 bar**		0 to 20 bar	0 to 20 bar**	0 to 20 bar	0 to 20 bar**
System temp. (°C)	-15 to +150	-15 to +250	0 to +60		-70 to amb	-100 to +250	-15 to +150	-15 to +250
Pump channels	2		2	4	2	4	2	4
Chip reactors	✓	✓	✓	✓	✓	✓	✓	✓
Tube reactors	✗	✓	✗	✓	✗	✓	✓	✓
Column reactors	✗	✓	✗	✓	✗	✓	✓	✓
Electrochemistry	✗	✗	✓	✓	TUBE	CRYO	✗	✗
FLUX volume	N/A		225 µL		N/A		N/A	
Product collection	✗	MANUAL	MANUAL	AUTO	AUTO	AUTO	AUTO	AUTO
Aqueous work-up	✗	✗	✗	✗	✗	✓	✗	✓
Pressurized inputs	✗	✓	✓	✓	✓	✓	✓	✓
Injection valves	✗	2	2	4	2	4	2	4
Auto injection valves	✗	✗	✗	✗	✗	2	✗	2
Analysis interface	✗	✗	✗	✗	✗	✗	✗	✓
Automation	✗	✗	✗	✓	✓	✓	✗	✓

	Cold		Nanoparticle		Scale-Up		Premium	
	Regular	Advanced	Regular	Advanced	Regular	Advanced	Regular	Advanced
Flow rate	1.0 µL/min to 10 mL/min*		1.0 µL/min to 10 mL/min*		1.0 µL/min to 10 mL/min*		1.0 µL/min to 10 mL/min*	
Pressure (bar)	0 to 20 bar	0 to 20 bar**	0 to 20 bar	0 to 20 bar**	0 to 20 bar	0 to 20 bar**	0 to 20 bar	0 to 20 bar**
System temp. (°C)	-70^ to amb	-100 to +250	amb to +150	-15 to +250	-70 to amb	-100 to +250	-70 to amb	-100 to +250
Pump channels	2	4	2	4	2	4	4	6
Chip reactors	✓	✓	✓	✓	✗	✗	✓	✓
Tube reactors	✗	✓	✓	✓	✗	✓	✓	✓
Column reactors	✗	✓	✗	✗	✗	✓	✓	✓
Cooled reactors	TUBE	CRYO	✗	✗	TUBE	CRYO	TUBE	CRYO
FLUX volume	N/A		N/A		N/A		225 µL	
Product collection	MANUAL	AUTO	MANUAL	AUTO	✗	MANUAL	AUTO	AUTO
Aqueous work-up	✗	✗	✗	✗	✗	✓	✓	✓
Pressurized inputs	✓	✓	✓	✓	✓	✓	✓	✓
Injection valves	2	4	✗	4	✗	2	4	4
Auto injection valves	✗	2	✗	✗	✗	✗	✗	2
Analysis interface	✗	✗	✗	✗	✗	✓	✓	✓
Automation	✗	✓	✗	✓	✗	✓	✓	✓

Solvent cheat sheet

	Boiling point (°C)		
	1 bar	10 bar	20 bar
Acetoc Acid, Glacial	118	214	263
Acetone	56	146	179
Acetonirile	82	163	214
1-Butanol	118	205	263
2-Butanol	100	160	238
Chloroform	61	156	186
Cyclohexane	81	187	213
Dichlorobenzene	180	220	345
N,N-Dimethyl Formamide	153	250	309
Dimethyl Sulfoxide	189	268	358
1,4-Dioxane	101	200	240
Ether, Anhydrous	35	125	151
Ethyl Alcohol	78	152	209
Ethyl Acetate	77	174	208
n-Heptane	98	187	236
n-Hexane	69	171	197
Isobutyl Alcohol	108	182	249
Methanol	65	142	191
Methyl Ethyl Ketone	80	181	212
Methylene Chloride (DCM)	40	123	158
Pentane	36	126	152
2-Propanol	82	156	214
Tetrahydrofuran	66	164	193
Toulene	110	217	252
Water	100	184	239
Xylene	143	250	296

Support

Syrris is on hand to help when you need it. From feasibility studies and proof of concept, through to on-site support by a Syrris engineer, our team are experienced chemists and are supported by a network of trained distributors in over 40 countries.

Built by our UK production team to the highest standard, with chemically resistant materials, Syrris products ensure years of continued service. A 1-year warranty as standard and the option to extend this further for complete peace of mind.

Ask the experts

One of the biggest barriers to performing your chemistry in continuous flow is the conversion of your existing techniques into flow techniques. That's where we come in!

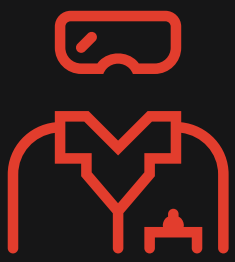
Feasibility studies

Syrris staff have many years of experience working with chemists in all industries on a range of applications. We have successfully "proven" to countless businesses how a switch to continuous flow would improve the yield, safety, and speed of their chemistry compared to their existing methods.

Talk to Syrris about how we will work with you to provide feasibility studies before you commit to buy.

Batch and flow combined

While many chemists successfully switch their entire process to continuous flow, a "batch and flow" combined approach may be best, depending on your chemistry. With a wealth of experience in traditional batch chemistry techniques and industry leading batch chemistry products, Syrris is well placed to help.

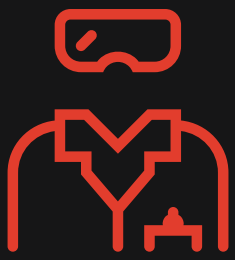


"We chose the Asia Flow Chemistry System because of its ability to provide options for multiple setups in a single platform: this level of flexibility is unique to Asia products"

Florin Oancea, Director at ICECHIM

"The system is running seven days a week and is so popular that people are queuing up to use it"

Dr. Rodrigo Souza, Associate Professor in Organic Chemistry, UFRJ, Brazil



400

Publications

Syrris products have been cited in over 400 peer-reviewed publications, demonstrating their viability for real-world chemistry

120

Employees

Over 120 employees work on behalf of the Syrris brand and its products, including over 25 qualified Chemists and Chemical Engineers

1000s

of Users

Thousands of chemists and chemical engineers use Syrris products in their ground-breaking research and development, including at the world's top 20 pharmaceutical, chemical, and food and fragrance companies

Get in touch

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