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Flow Reactor

KeyChem Series

What is “KeyChem”

KeyChem is an abbreviation for keyboard chemistry. “Keyboard chemistry” has been coined by YMC by combining the words “Keyboard” (as in computer control) and “Chemistry”, to represent the new concept of a chemical reaction methodology that YMC is creating. Central to this concept is the microreactor system, which allows computer-controlled flow reaction and enables the setting of all the conditions of a chemical reaction from start to finish, via the keyboard of a computer.

Product Comparison Table

Wide variety including Liquid-Liquid reaction system for rapid mixing of reaction liquid, and system specializing in hydrogenation or photoreaction

	Reaction type					Other	
	Liquid-Liquid	Gas-Liquid	Solid-Liquid	Gas-Solid	Photoreaction	PC Control	Customization
KeyChem-Basic	Yes	No	No	No	No	No	Yes
KeyChem-L/LP	Yes	No	No	No	No	Yes	Yes
KeyChem-Lumino	No	No	No	No	Yes	Yes	Yes
KeyChem-Integral	Yes	Yes	Yes	Yes	No	Yes	Yes

The above products can be customized to add reaction type.

Micro Flow Reactor System

KeyChem-Basic

Perform flow reaction easily

- Micro-flow starter kit to get started quickly
  - Type-1 : Simple system
  - Type-2 : Standard system
  - Type-3 : Two-stage reaction system
  - Type-4 : System equipped with thermal control unit
- Other types are available upon request

KeyChem-L / KeyChem-LP

Flow reactor system by PC control

- Superior mixing, precise thermal control, continuous-flow reactor
- Set conditions of reaction by numerical entry into PC controlled system
  - KeyChem-L : Syringe pump type for stable pumping
  - KeyChem-LP : Plunger pump type for continuous pumping

Flow Photoreactor System

KeyChem-Lumino

Expand possibility of photoreaction by superior efficiency of light irradiation

- Uniform light irradiation to sample, introducing micro channels
- Materials of light source and reactor are selectable
- Achieve precise photoreaction

Heterogeneous Flow Reactor System

KeyChem-Integral

Heterogenerous reactions in single system

- Single system plays 4 roles : Reaction of Gas-Liquid, Liquid-Liquid, Solid-Liquid and Solid-Liquid-Gas
- Porous Teflon® (AF2400) is used for the reactor of Gas-Liquid reaction
- Flow rate, temperature and pressure are controllable.
- The number of units and combinations are selectable.

Coil Reactor Unit

- Reactor for Gas-Liquid reaction made of Teflon® AF2400
- Dispersing gas gradually into liquid flowing in a SUS tube through porous of Teflon®
- Mixing gas and reaction liquid homogeneously

Mixing Block Unit

- Flow micro mixer for Liquid-Liquid reaction
- Improvement on reaction yield with rapid mixing in micro space feature

Column Reactor Unit

- Catalyst column packed with reaction liquid
- High reaction efficiency with high level contact of catalyst and reaction liquid
- No need to remove catalyst

Pump Unit

- Sending solution by plunger pump
- Highly accurate and stable in flow rate
- Available in 3 types according to flow rate range
- Available wetted material : PEEK or SUS

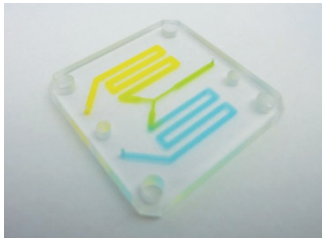
Pump Unit	Material	SUS	PEEK	SUS	PEEK
	Type	Plunger			
	Range	0.001 - 9.999 mL/min		0.01 - 99.99 mL/min	0.1 - 50.0 mL/min
	Pressure limit	35 MPa	20 MPa	5 MPa	5 MPa
	Dimension	(W X D X H) 105 X 241 X 144 mm			
Coil Reactor Unit		Low Temperature Type		High Temperature Type	
	Method	Peltier		Heating	
	Range	5 - 80℃		r.t.+10℃ - 200℃	
	Dimension	(W X D X H) 250 X 225 X 175 mm			
Mixing Block Unit		Low Temperature Type		High Temperature Type	
	Method	Peltier		Heating	
	Range	5 - 80℃		r.t.+10℃ - 200℃	
	Dimension	(W X D X H) 250 X 225 X 175 mm			
Column Reactor Unit					
	Method	Thermal Vibration			
	Range	r.t.+10℃ - 200℃			
	Dimension	(W X D X H) 250 X 225 X 347 mm			

Reactor

KeyChem series mixer

Three kinds of micro-mixers with different mixing configurations are available.

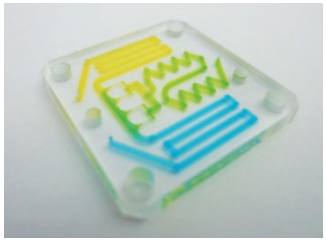
Hadar (Y type)



- Mixing on collision in simple Y-shaped channel
- Ideal for synthesis from drop

Material	Model number
SUS316	KC-M-Y-SUS
Glass	KC-M-Y-GL
PTFE	KC-M-Y-P

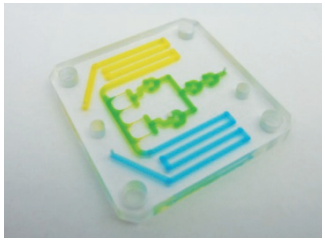
Deneb (Helix type)



- Powerful agitation, structure suitable for organic synthesis
- Mixing after 3D motion

Material	Model number
SUS316	KC-M-H-SUS
Glass	KC-M-H-G
PTFE	KC-M-H-P

Spica (Static type)



- Mixing after repeated bifurcation and merging

Material	Model number
SUS316	KC-M-S-SUS
Glass	KC-M-S-G
PTFE	KC-M-S-P

Pump

YSP series Syringe pump

High-performance and cost-effective syringe pumps

Usable for micro-flow reaction, dripping reagents, pharmacological experiment, animal testing, etc.

YSP-101 (Standard type)

Infuse only and no capability to withdraw

- Deliver constant volumes and microliter volumes
- Change flow rate during operation
- A variety of types available to suit your needs
- Compatible with various syringe sizes and types from major manufacturers

YSP-201 (High performance type)

Similar to YSP-101 but with withdrawal function

YSP-301 (High performance & high pressure type)

Includes features of YSP-201 and high pressure pumping function

YSP-202 (Double syringe type)

Similar to YSP-201 but holds 2 syringes

Model	YSP-101	YSP-201	YSP-301	YSP-202
Syringe type	Standard type	High performance type	High performance & high pressure type	Double syringe type
Infusion	Yes	Yes	Yes	Yes
Withdrawal	No	Yes	Yes	Yes
Programmable pump	No	Yes	Yes	Yes
PC Contorol	No	Yes	Yes	Yes
Minimum flow rate*1	0.012 µL/min		0.023 µL/min	
Maximum flow rate*2	31.5 mL/min	42.57 mL/min	153.3 mL/min	76.32 mL/min*3

The pumps may not be used at max. or min. flow rate under certain conditions.

*1 Obtained using a 1 mL gastight syringe. *2 Obtained using a 50 mL gastight syringe. *3 Obtained using a 25 mL gastight syringe.