YMC
EUROPE GMBH

# FLOW CHEMISTRY

Beispielreaktionen:
+++ Grignaud +++ Alkylierungen +++ Wittig +++ Brominierungen +++ Chlorirung +++ Nitrierung +++ Simmens-Smith +++ PMP +++ Aminierung +++ Mithylierung +++ Bouvault Aldehyd-Synthese +++ Mitsunobu-Reaktion +++ Suzuki-Coupling +++ +++ NaBh4-Reduktion +++ Sonogashira-Coupling +++

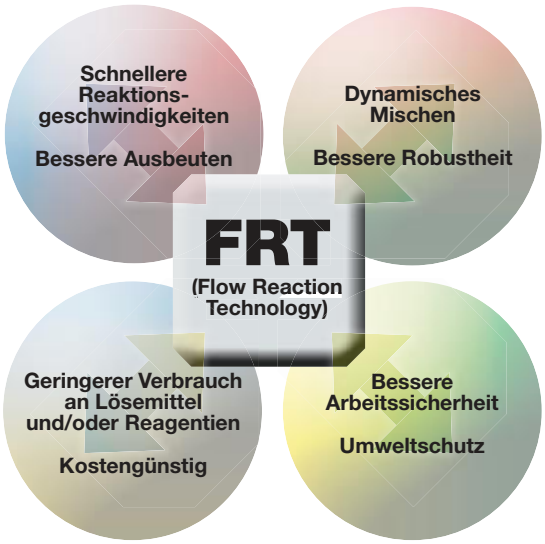
## Allgemeines

Mikroreaktionstechnik zählt gegenwärtig zu einer der innovativsten Technologien auf dem Gebiet der chemischen Synthese und verwandter Gebiete. Mikrostrukturierte Reaktoren halten jetzt Einzug in die Labore. Weltweite Forschungsaktivitäten zeigen eindrucksvoll, dass sich durch den Einsatz von Mikroreaktoren eine Vielzahl von reaktionstechnischen Vorteilen in chemischen Prozessen und Reaktionen erzielen lassen. YMC Europe bietet eine vollständige Produktreihe, größtenteils automatisierter Mikroreaktoren für Forschung und Produktion an. Mit den Produktserien KeyChem und CYTOS kann der gesamte Syntheseworkflow vom Forschungslabor bis zum Technikumsmaßstab wirkungsvoll unterstützt werden.

Ein umfangreiches Baukastensystem für die ersten Schritte im Forschungslabor bis hin zur Produktion unterstützt sowohl Einsteiger, als auch erfahrene Anwender bei der Umsetzung neuer Synthesestrategien. So sind erste Orientierungsexperimente mit dem KeyChem Basic System einfach und schnell umsetzbar. Mit den KeyChem-L Modulen stehen automatisierte, softwaregesteuerte Systeme mit umfangreichem Datenlogging sowie einer breiten Auswahl an Reaktoren und Zubehör zur Verfügung. Die CYTOS 200 und CYTOS 2000 Serie stellt den Einstieg in den Technikums- und Produktionsmaßstab dar.

Die Auswahl der Reaktoren erfolgt aufgrund der Erfordernisse der durchzuführenden Reaktionen und aufgrund der Art und Weise, wie der Kunde die Anlage einsetzen möchte. Die Fördermodule sind ebenfalls von den eingesetzten Reaktoren abhängig. Im Bereich der flüssigen Medien erstreckt sich das Spektrum der eingesetzten Pumpen von analytischen HPLC Pumpen bis hin zu hochdruckresistenten Präzisionsspritzenpumpen. So ist es mit Präzisionsspritzenpumpen möglich, konstante Stoffströme bis in den Nanoliterbereich kontinuierlich auch gegen hohe Drücke zu fördern. Die Module dieses Systems arbeiten auch unter Druck stabil und störungsfrei, selbst bei der Förderung viskoser Medien. Unterschiedliche Mischer und Verweilmodule von wenigen Mikrolitern bis hin zum großvolumigen Milliliter-Modul sind mit unterschiedlicher Geometrie verfügbar. Innovative Peltiertechnik ermöglicht bei den KeyChem-Systemen Heizen und Kühlen ohne Kryostat oder zusätzliche Wärmeträgermedien.

YMC Mikroreaktoren leisten einen Beitrag zum Konzept der „Green Chemistry“, indem sie Anwendern ermöglichen, ressourcenschonende Synthese- und Produktionsverfahren zu finden und in den Produktionsprozess zu integrieren.



# SYSTEMS

## KeyChem-L:

Das System KeyChem-L bietet Mikroreaktionstechnik mit kompaktem Design, einer Spritzenpumpe und Temperaturregelung durch Peltier Elemente.

**Produktmerkmale**

- Ideale Positionierung im Labor durch modulare Bauweise; PC, Pumpe und Thermoelement sind voneinander getrennt.
- Das System kann auf die individuellen Ansprüche jedes Kunden angepasst werden
- Benutzerfreundliche Software zur Steuerung
- Hervorragende Durchmischung und Temperierung
- Und nicht zuletzt, ein günstiger Preis!

## KeyChem Lumino:


Für photochemische Reaktionen können KeyChem-Systeme einfach und schnell aufgerüstet werden:
KeyChem-Lumino ist ein Photomikroreaktor, wahlweise aus rostfreiem Stahl (SUS316) mit Deckel aus Quarzglas oder $TiO_2$-beschichtet, der von einer abgeschirmten Hochleistungslichtquelle bestrahlt wird.
KeyChem-Lumino Photomikroreaktoren sind mit UV-Quellen verschiedener Wellenlängen und Energieeinträgen lieferbar:

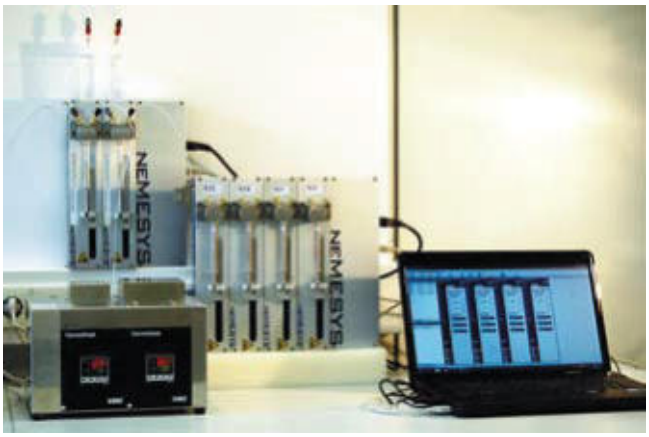
Niederdruck-Quecksilber-Lampe
mit 254 nm Wellenlänge

Excimer-Lampe 308 nm oder

regelbare 6-fach LED's mit 365 nm.

## KeyChem-L/HP:

KeyChem-L-HP ist ein kontinuierlich arbeitendes Autoklavensystem für alle Reaktionen, die unter Druck stattfinden können. Im Mitteldruckbereich sind 30 bis 50 bar möglich, Hochdruck-Reaktoren auf Anfrage lieferbar. Alle Reaktoren und Verweilschleifen sind in Edelstahl oder Hastelloy verfügbar.
Die Temperierung erfolgt über peltiergesteuerte Thermostaten, die schnelles Heizen und Kühlen ermöglichen.




## CYTOS:

CYTOS ist ein modulares System zur Produktion größerer Mengen, mit einer Größenordnung von einigen 100 Gramm bis Kilogramm – je nach Syntheseverfahren und Auslegung der Anlage. Durch Verschalten mehrerer CYTOS Module (Numbering – up) sind größere Stoffumsätze erreichbar. Durch Parallelisieren kann aus einem einzelnen CYTOS Reaktor ein leistungsfähiges Produktionssystem aufgebaut werden. Dieses Konzept hat den Vorteil der größten möglichen Flexibilität im Anlagenbetrieb. Fällt ein Reaktor aus, kann ein Reservesystem dessen Funktion übernehmen, ohne dass die Funktionalität der Anlage beeinträchtigt wird. Für CYTOS steht eine abgestimmte Auswahl an Dosier- und Temperier-Komponenten zur Verfügung, die über eine intuitiv zu bedienende Software mit Datenaufzeichnung gesteuert werden können.

# FLOW CHEMISTRY

## FRX – Flow Chemistry

Die FRX-Reihe von Syrris macht FlowChemistry kosteneffektiv, einfach in der Handhabung, verständlich und gleichzeitig kostengünstig.
Die FRX-Reihe besteht aus mehreren einzelnen Modellen in modularer Bauweise, so dass diese unkompliziert zu einfachen aber leistungsstarken FlowChemistry-Systemen zusammengestellt werden können.

## Africa–automatisierteFlowChemistry

Africa ist das komplexeste und flexibelste Mikroreaktorsystem, welches verfügbar ist. Reaktionsoptimierungen, programmierte Synthesen oder präparative Synthesen können auf dem Africa-System mit anschließender Aufbereitung und Analyse vollautomatisch realisiert werden.

## YMC Auftragssynthese und Entwicklung

Das Labor in Dinslaken (Nähe Düsseldorf) unterstützt Anwender wirkungsvoll in der Methodenentwicklung und -optimierung. Dort werden auch Auftragssynthesen, (präparative) Auftragstrennungen mittels HPLC, Schulungen und Seminare durchgeführt.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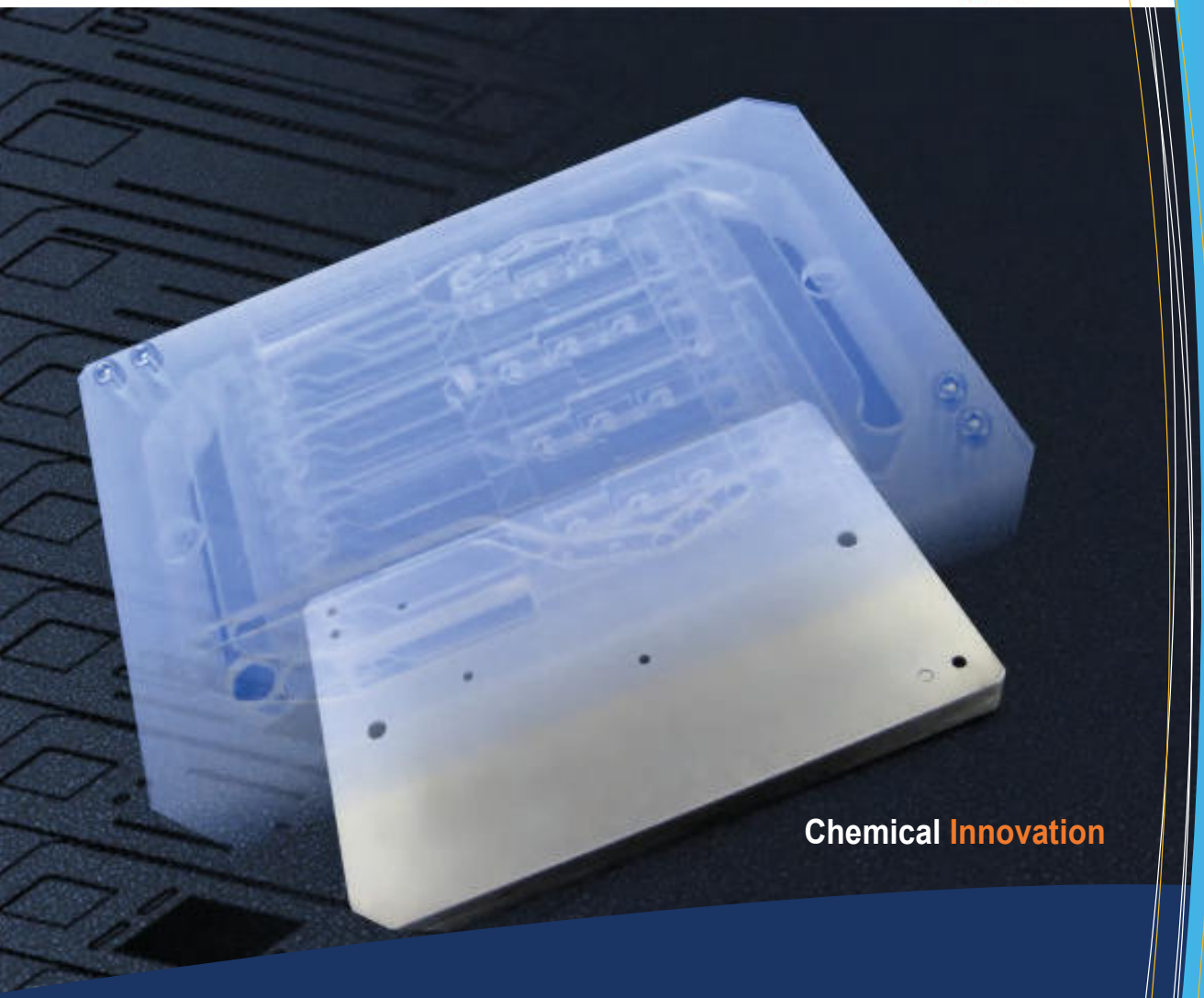
YMC
Keyboard Chemistry®




# Keyboard Chemistry®

## Version 10.5
## Microreactor general catalog

Microreactor Systems
Reactor・Residence time units
Thermostats
Pumps
Accessories・Consumable parts

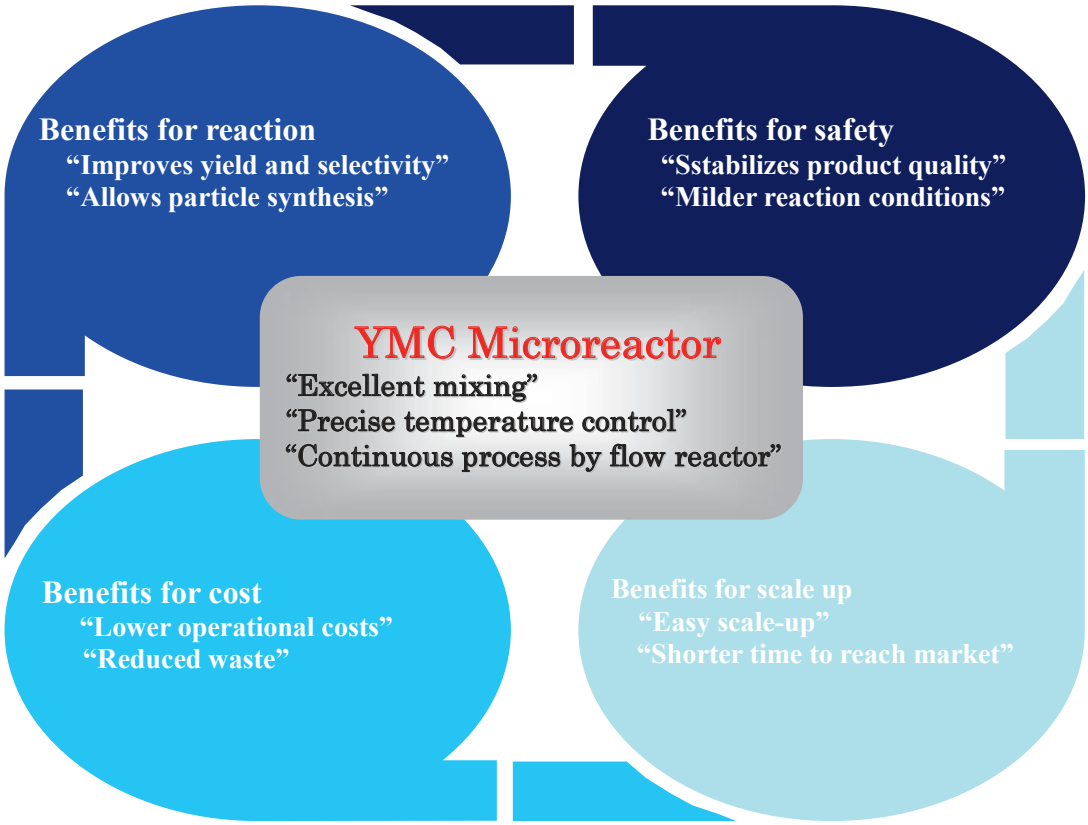
YMC Co., Ltd.

# YMC aims to create “Keyboard Chemistry®”.

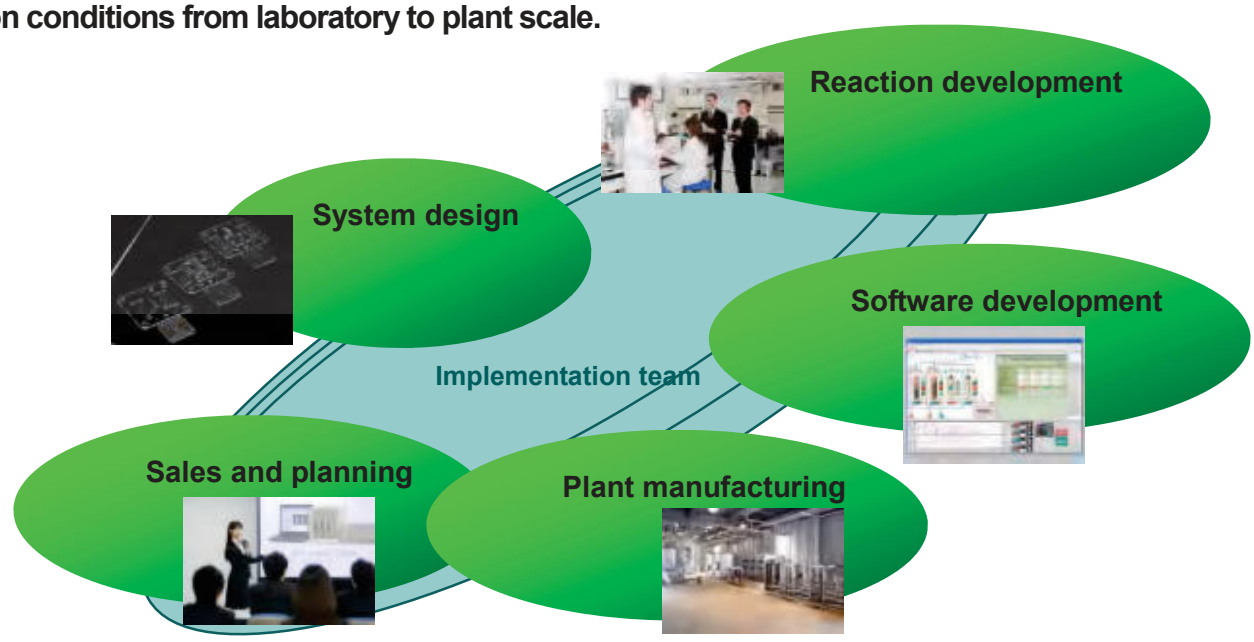
“Keyboard chemistry®” has been coined by YMC by combining the words “Keyboard” (as in computer control) and “Chemistry”, to represent the new concept of a chemical reaction methodology that YMC is creating.
Central to this concept is the microreactor system, which allows computer-controlled flow reaction and enables the setting of all the conditions of a chemical reaction from start to finish, via the keyboard of a computer. Many innovative reaction parameters, which can not be achieved when using conventional flasks and reaction vessels now become possible.
By extending the concept of Keyboard Chemistry® from chemical reactions to peripheral technologies such as pre-treatment, post-reaction analysis, separation and purification, YMC aims to change the landscape of chemistry forever.

## YMC supplies the microreactor equipment which brings this innovation for R & D and

**What is a microreactor ?**
The term “microreactor” is the generic name given to devices that enable continuous flow reactions which micro-fabricated modules (mixer, heat exchanger, etc.) with typical thicknesses below 1 mm.




**YMC is ready to develop apparatus which satisfies customers’ needs and provides the optimized reaction conditions from laboratory to plant scale.**



## Company Information

| | |
|---|---|
| Company name | YMC Co., Ltd. |
| Founded | January 28th, 1980 |
| Activities | Production and sales of packing materials and packed columns for high performance liquid chromatography (HPLC), Custom purification and synthesis.<br>Manufacture and sales of microreactor systems and devices |
| Head office address | YMC Karasuma-Gojo Bldg., 284 Daigo-cho, Karasuma Nishiiru Gojo-dori, Shimogyo-ku,<br>Kyoto 600-8106, Japan |
| CEO | Ryuji YAMAMURA |
| Capital | 627 million yen |
| Annual turnover（consolidated） | 4254 million yen (2010) |
| No.of employees（consolidated） | 246 (as of Mar. 2010) |
| Locations | YMC Co.,Ltd. Komatsu Works（Komatsu City, Ishikawa prefecture）<br>YMC Co.,Ltd. Tokyo Sales Office（Chiyoda-ku,Tokyo）<br>YMC Microreactor Research Center（Kumiyama-cho, Kyoto.）<br>Shanghai representative office |
| Affiliated companies | Aishin Kohki Co., Ltd.<br>YMC Europe GmbH<br>YMC America Inc.<br>YMC India (Pvt.) Ltd. |

Head Office.

Microreactor Research Center

Tokyo Sales Office.

Komatsu Works.

## History of Microreactor Business

| | |
|---|---|
| Apr. 2005 | Become an exclusive distributor of CPC（Germany） microreactors for Japan |
| Aug. 2007 | Establish YMC Microreactor Research Center |
| Oct. 2007 | Purchased all assets of CPC（Germany） |
| Nov. 2007 | Became an exclusive distributor of CORNING SAS Advanced Flow Reactor for Japan |
| Apr. 2008 | Start sales of CPC CYTOS® series microreactors made in Japan<br>Start sales of the YMC original microreactor (KeyChem®-L) |
| Aug. 2008 | Investment in Syrris, a UK microreactor manufacturer |

KeyChem®-L

CYTOS®

Corning product

Syrris product

# CONTENTS

## Microreactor Systems A



## Reactors・Residence time units B

## Thermostatic units

C

| | |
|---|---|
| 1 | Coupling type Thermo Stages (Low temperature version･2 type/3 type/4 type) |
| 2 | Coupling type Thermo Stages (High temperature version･2 type/3 type/4 type) |
| 3 | Stand-alone type Thermo Stage (Low temperature version･Mixer/RTU) |
| 4 | Stand-alone type Thermo Stage (High temperature version･Mixer/RTU) |
| 5 | KeyChem®-Lumino Thermo Stage |

## Pump

D

| | |
|---|---|
| 1 | MR2 Syringe pump (1-5 way valvex4) |
| 2 | MR2 Syringe pump (1-5 way valvex2)、(1-2 way valvex2) |

## Accessories･Consumable parts

E

| | |
|---|---|
| 1 | Tubing connector 1/16 inch (pack of 10) Stainless steel |
| 2 | Tubing connector 1/16 inch PEEK･M6HN |
| 3 | Luer lock Connector |
| 4 | KeyChem®-L Tubing connector (Low temperature version) |
| 5 | KeyChem®-L Tubing connector (High temperature version) |
| 6 | Connector 1/16 inch (pack of 10) ETFE |
| 7 | EASYFITT10φ(pack of 10) |
| 8 | Housing connector (Stainless steel tubing version) |
| 9 | Syringe adapter (female type) |
| 10 | Luer adapter (male type) |
| 11 | Ferrule 1/16 inch (pack of 10) PTFE |
| 12 | Ferrule 1/16 inch (pack of 10) Stainless steel |
| 13 | Ferrule 1/16 inch (pack of 10) PTFE･GF |
| 14 | Back pressure regulator 5 psi |
| 15 | Back pressure regulator 20 psi |
| 16 | Back pressure regulator 40 psi |

| | |
|---|---|
| 17 | In-line check valve |
| 18 | In-line filter set (includes 10 filters) |
| 19 | Suction filter (PP) |
| 20 | Suction filter (SUS) |
| 21 | T type reactor･inside diameter 0.5 mm (Stainless steel) |
| 22 | T type reactor･inside diameter 1.0 mm (Stainless steel) |
| 23 | T type reactor･inside diameter 0.25 mm (PEEK) |
| 24 | T type reactor･inside diameter 0.5 mm (PEEK) |
| 25 | T type reactor･inside diameter 1.0 mm (PEEK) |
| 26 | PTFE tubing (Outside diameter 1/16 inch･inside diameter 0.25 mm･length 10 m) |
| 27 | PTFE tuing (Outside diameter 1/16 inch･inside diameter 0.5 mm･length 10 m) |
| 28 | PTFE tubing (Outside diameter 1/16 inch･inside diameter 0.75 mm･length 10 m) |
| 29 | PTFE tubing (Outside diameter 1/16 inch･inside diameter 1.0 mm･length 10 m) |
| 30 | Stainless steel tubing (Outside diameter 1/16 inch･inside diameter 0.5 mm･length 10 m) |
| 31 | Stainless steel tubing (Outside diameter 1/16 inch･inside diameter 1.0 mm･length 10 m) |
| 32 | KeyChem® Mixer housing |
| 33 | KeyChem® Mixer housing (Acrylic) |
| 34 | KeyChem® Residence time unit housing |
| 35 | CYTOS®-200 Reactor housing |
| 36 | CYTOS®-200 Clamping unit |
| 37 | KeyChem®-Lumino Reactor housing |
| 38 | Hamilton Syringe attachment kit for MR2 pump (2.5 mL/1 mL) |
| 39 | Hamilton Syringe attachment kit for MR2 pump (5 mL) |
| 40 | Hamilton Syringe attachment kit for MR2 pump (10 mL) |
| 41 | Hamilton Syringe attachment kit for MR2 pump (25 mL) |
| 42 | Disposable Syringe attachment kit for MR2 pump (2 mL) |
| 43 | Disposable Syringe attachment kit for MR2 pump (5 mL) |
| 44 | Disposable Syringe attachment kit for MR2 pump (10 mL) |
| 45 | Disposable Syringe attachment kit for MR2 pump (20 mL) |
| 46 | KLOEHN Syringe attachment kit for MR2 pump |
| 47 | Reservoir base for MR2 pump |
| 48 | Reservoir base with pressure meter for MR2 pump |
| 49 | O-ring for CYTOS® (Heat fluid line) |
| 50 | O-ring for CYTOS® (Reaction line) |
| 51 | STACKING DRY BATH |
| 52 | UV light source unit for KeyChem®-Lumino (365 nm) |
| 53 | Low pressure mercury lamp for KeyChem®-Lumino (254 nm) |
| 54 | Excimer lamp for KeyChem®-Lumino (308 nm) |

- KeyChem®-L
- CYTOS®-200
- CYTOS®-2000
- KeyChem®-Lumino
- KeyChem®-H
- KeyChem®-Basic
- Microreactor simple kit

# A

## Microreactor Systems

1 Microreactor System KeyChem® series

# KeyChem®-L

**Model number MicroreactorSystem-KL**

## Description

Flow chemistry apparatus of compact design with a syringe pump and temperature control by a Peltier thermostat.

## Features

- The separate construction of each component (PC, syringe pump and thermostat) allows optimum positioning.
- It allows system configuration for the user's needs.
- Compact design allows for easy installation.
- User-friendly software
- Excellent mixing and temperature control
- Affordable pricing

## Specification

| | | |
|---|---|---|
| | Throughput | Several hundred g/day |
| Pump | Type | Syringe pump |
| | Syringe size | 1 mL - 25 mL |
| | Flow rate range | 0.7 μL/min - 55 mL/min<br>(recommended flow rate range : 10 μL/min - 10 mL/min) |
| Temperature unit | Temp. type | Peltier control |
| | Range | Approx. -15 - 80 °C (Standard type)<br>• High temperature type is available.(ambient temperature – 150 °C ) |
| Reactor unit | Mixer type | Y type, Static type, Helix type |
| | Residence time unit | Volume : 1.5 mL, 3.0 mL, 4.5 mL |
| | Reactor material | Stainless steel 316, Hastelloy, Glass, PTFE |

### Mixers

Three types of micromixer and three kinds of Residence time units are available as standard.

### Fluid pumps

Three different brands of syringes are used as standard with easy mounting/removal. Continuous flow can be achieved by using two syringes with alternate strokes (optional).

### Thermostatic units

Thermo stages controlled by a Peltier unit covering a wide range of temperature are available to suit the user's needs.

2 Microreactor System CYTOS® series

# CYTOS®-200

**Model number MicroreactorSystem-200**

## Description

Optimized flow chemistry apparatus for R&D use with a syringe pump and an independent thermostat with a wider range of temperature control

## Features

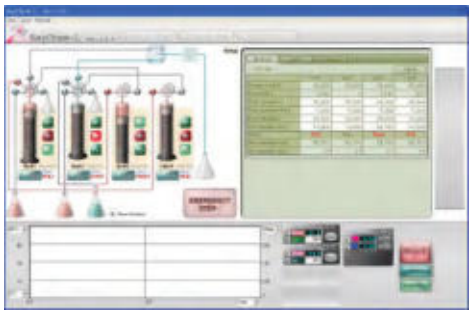
- Precise temperature control by excellent heat exchange efficiency
- It is an improved version of CPC CYTOS®-M.
- Robust design of long term performance
- Full PC control

## Specification

| | | |
|---|---|---|
| | Throughput | Several hundred g/day |
| Pump | Type | Syringe pump (Piston pump is also available.) |
| | Syringe size | 1 mL - 25 mL Syringe |
| | Flow rate range | 0.7 μL/min - 55 mL/min<br>(recommended flow rate range : 10 μL/min - 10 mL/min) |
| Temperature unit | Temp. type | Heat fluid circulation<br>(A thermostat is not included as standard supply.) |
| | Range | -20 - 170 °C (Depending on the thermostat used) |
| Reactor unit | Mixer type | Sargas(Y type), Regulus(CYTOS®-M type) |
| | Residence time unit | Volume : 0.9 mL, 1.8 mL, 4.5 mL |
| | Reactor material | Stainless steel 316, Glass |

### PC control

User friendly software is provided to set, and monitors the pressure and the temperature. It also allows saving and analyzing of the experimental data.



### Fluid pumps

Three different brands of syringes are used as standard with easy mounting/removal. Continuous flow can be achieved by using two syringes with alternate strokes (optional).

3 Microreactor System CYTOS® series

# CYTOS®-2000

**Model number MicroreactorSystem-2000**

## Description

Versatile flow chemistry apparatus covering a range from laboratory use to production scale with high performance piston pumps(0.1 mL - 20 mL/min)

## Features

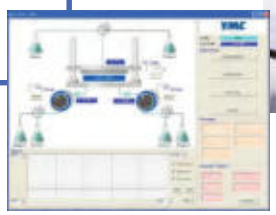
- Optimized apparatus for process development from research use to bench scale synthesis
- It is an improved version of CPC CYTOS®-L.
- Easy optimization based on accurate parameters setting
- Multistep reaction is available due to external modules.
- Continuous flow is available from piston pumps.
- Reactor volume is 10 times larger than that of CYTOS®-200 allowing easy scale-up to be achieved.

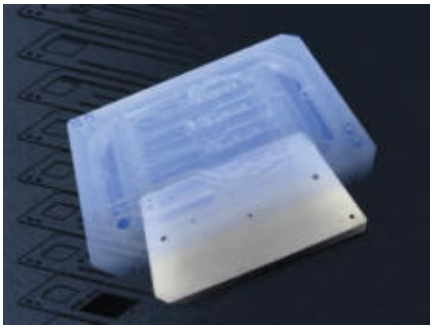
## Specification

| | | |
|---|---|---|
| | Throughput | - Several kg/day |
| Pump | Type | Piston pump |
| Temperature unit | Temp. type | Heat fluid circulation (A thermostat is not included as standard supply.) |
| | Range | -20 - 170 °C (Depending on the thermostat used) |
| Reactor unit | Reactor | CYTOS®-L type |
| | Residence time unit | Volume : 15 mL, 60 mL |
| | Reactor material | Stainless steel 316, Hastelloy |

### Dedicated software

User friendly software is provided by way of the touch panel and PC control with a simple display. It allows monitoring of the temperature and the pressure and allows saving and analyzing of the experimental data.





### Large volume microreactor

The reactor has the same design configurations as the CYTOS®-200's with the equivalent heat exchange and mixing efficiency. This allows easy scale-up with the same reaction conditions to be achieved. Several sizes of resistance time units are available for different reaction

4 Microreactor System KeyChem® series

# KeyChem®-Lumino

**Model number MicroreactorSystem-LU**

## Description

Flow chemistry apparatus dedicated for photo-reactions

This system can connect every pump (Please see the pumps section).

## Features

- Excellent light irradiation efficiency
- Various light sources
  (LED light source, low pressure mercury lamp, excimer lamp)
- Precise temperature control possible
- The reactor can be disassembled
- Compact design for optimization of work space

## Specification

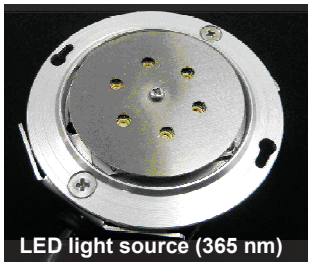
| | |
|---|---|
| **Light source** | |
| **Lamp (6 LEDs in light emitting unit)** | |
| Light type | Ultraviolet emission LEDs |
| Peak wavelength | 365 nm (25 °C) |
| Life time | 500 hours in continuous operation |
| Light power | Max. 250 mW (each) |
| Power requirements | AC 100-240 V, 100 W |
| Dimensions | (WxDxH)<br>Light emitting unit : 55x57x40 mm<br>Power source unit : 50x250x161 mm |
| **Reactor unit** | |
| material | Stainless steel 316, Quartz glass(cover) |
| Channel width | 1.0 mm |
| Channel depth | 0.2 mm |
| Channel length | 560 mm |
| Volume | 110 μL |
| Dimension | ϕ50×20 mm (excluding projection) |
| **Temperature unit** | |
| Power requirements | AC 100 - 240 V, 100 W |
| Temp. type | Peltier unit |
| Range | -15 - 80 °C |
| Precision | ±1 °C |
| Dimension | (WxDxH) 120x230x205 mm |
| Weight | Approx. 4 kg |

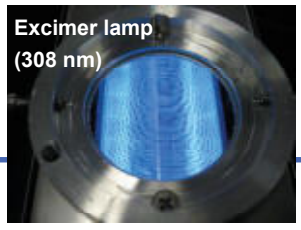
### High performance LED light source

Uses a high performance LED as light source

The power output can be adjusted

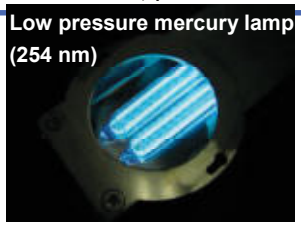
Light dose not leak outside reactor.



LED light source (365 nm)


Excimer lamp (308 nm)

### Light sources

Three light sources available：LED light source, low pressure mercury lamp, excimer lamp. For additional information, please see the accessories section.


Low pressure mercury lamp (254 nm)

### Reactor

A reactor which is coated on surface with $TiO_2$ as a light catalyst is also available (not the stainless steel reactor).

5 Microreactor System KeyChem® series

# KeyChem®-H

**Model number** MicroreactorSystem-KH

## Description

High efficiency and safe hydrogenation is now a reality.

The hydrogen and the substrate are mixed in a gas-liquid micromixer, and flow into the reactor column filled with catalyst.

## Features

- New state-of-the-art hydrogen supplying system (Using metal hydride)
- Catalyst-filled column (Pd polymer bound)
- Various catalysts can be selected
- Column is available in a wide range of sizes.

## Specification

| | |
|---|---|
| Temp. Range (column oven) | ambient temperature - 100 °C |
| Pressure resistance | 0.98 MPa |
| Back pressure (Max) | 0.7 MPa |
| Flow rate range | 0.1 mL/min - 10 mL/min |
| Power requirements | AC 100 - 240 V, 50/60 Hz, 300 W |
| Dimensions | (WxDxH) 380x335x375 mm<br>including the display 380x335x530 mm |

*System option include expanded ranges for temperature, pressure, and flow rate Please inquire.

For added flexibility, options include expanded ranges of flow, temperature, and pressure.

Please enquire.

## Hydrogen absorbing alloy cylinder

Hydrogen storage on metal hydride is not at high-pressure, so it can be used safely even inside laboratories.

Reduces running costs

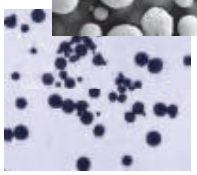
Hydrogen absorbing alloy cylinder (Standard size)

| | |
|---|---|
| Dimension | (O.D.xH)<br>54x270 mm |
| Hydrogen storage capacity | Approx. 220 L |
| Weight | Approx. 2.1 kg |
| Materials | aluminum alloy |

Cylinder is available in various other sizes

## Reaction column catalyst

The reaction column is filled with a dedicated hydrogenation polymer-supported Palladium catalyst. The catalyst is reusable.



Catalyst-filled column

| | |
|---|---|
| Filling catalyst | Pd polymer bound, Pd, Pd/C |
| Standard column size | (I.D.xL)<br>ϕ4.6x30 - ϕ10.0x150 mm |

Columns can be supplied with other catalysts; and can also be supplied in sizes other than the standard size.
Please enquire.

6 Microreactor System KeyChem® series

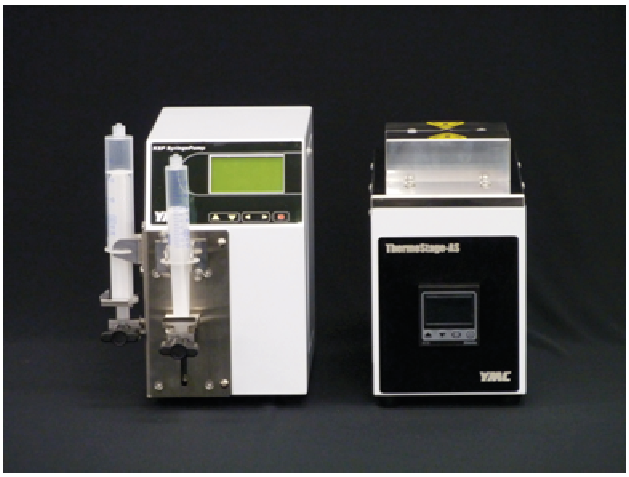
# KeyChem®-Basic

**Model number MicroreactorSystem-Ba**

## Description

Entry level unit for flow reaction based on KeyChem®-L

Only manual operation is available.



## Features

- Simple manual control
- Compact design
- Oil-free temperature control for safety operation
- Affordable pricing

## Specification

| | | |
|---|---|---|
| Pump | Type | Syringe pump |
| | Syringe size | 1 mL - 25 mL syringe |
| | Flow rate range | 0.7 μL/min - 17 mL/min |
| Temperature unit | Temp. type | Peltier unit |
| | Range | -15 - 80 °C (Standard)<br>High temperature type is available. (ambient temperature - 150 °C) |
| Reactor unit | Mixer | Y type, Static type, Helix type |
| | Mixer material | Stainless steel 316, Hastelloy, Glass, PTFE |

### Benefits of KeyChem®-Basic

- Campact space
- Simple reaction parameter setting
- Low price
- Commercially available pumps are usable.

### Thermostatic unit

Independent control

Temperature range : -15 - 80 °C or

ambient temperature - 150 °C

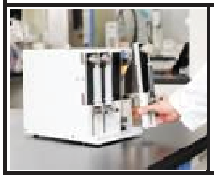
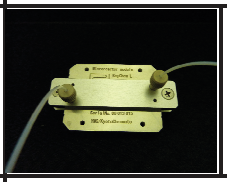
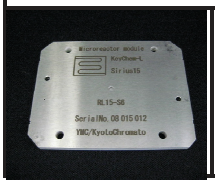
### Fluid pumps

Two types of syringe can be used.

Flow rate range : 0.7 μL/min - 17 mL/min

Syringe size : 1 - 25 mL

**In addition to the standard specifications, the following units are available as options depending on users' requirements.**

| Pumps | Mixers・Residence time units | Thermostatic units |
|---|---|---|
| MR2 syringe pump | KeyChem® Mixer<br>Hadar (Y type) | Independent Thermo Stage<br>(Low temperature version, Mixer) |
|  <br>Pump with four syringes<br>Suction/Discharge<br>(independently movable)<br>Usage size/1 - 25 mL<br>PC control |  <br>Matelial:Stainless steel 316<br>Channel structure:Y type |  <br>Range:-15 - 80 °C<br>Oil-free thermostat using Peltier control for mixer |
| | KeyChem® Mixer<br>Deneb (Helix type), Spica (Static type) | Independent Thermo Stage<br>(Low temperature version, RTU) |
| |  <br>Material:Stainless steel 316<br>Channel Structure:<br>Deneb:3 dimensional<br>Spica:repeating splitting and joining |  <br>Range:-15 - 80 °C<br>Oil-free thermostat using Peltier control for residence time unit |
| | KeyChem® Mixer<br>Glass | Independent Thermo Stage<br>(High temperature version, Mixer) |
| |  <br>Material:Glass<br>Channel structure:<br>Y type, Helix type, Static type |  <br>Range:ambient temperature - 150 °C<br>Oil-free Thermostat by heater control for mixer |
| | KeyChem® Mixer<br>Hastelloy | Independent Thermo Stage<br>(High temperature version, RTU) |
| |  <br>Material:hastelloy<br>Channel structure:<br>Y type, Helix type, Static type |  <br>Range:ambient temperature - 150 °C<br>Oil-free Thermostat by heater control for residence time unit |
| | KeyChem® Mixer<br>Hadar (Y type) PTFE | Housing kit<br>(KeyChem® Mixer) |
| |  <br>Material:PTFE<br>Channel structure:Y type<br>*Possible to disassemble |  <br>Housing of KeyChem® mixer for dipping |
| | KeyChem® Mixer<br>Rigel (Y + 4.5 mL type) | Housing kit<br>(KeyChem® RTU) |
| |  <br>Material:Stainless steel 316<br>Channel structure:Y type + 4.5 mL residence time unit |  <br>Housing of KeyChem® RTU for dipping |
| | KeyChem® RTU<br>Sirius (1.5, 3.0, 4.5 mL) | |
| |  <br>Material:Stainless steel 316<br>Plate of residence time unit for taking reaction time | |

Yellow area : KeyChem®-Basic Standard set (at last page)

7 Microreactor System

# Microreactor simple kit

**Model numbers see below**

## Description

Simple microreactor kit for beginners
(exclude the pump)

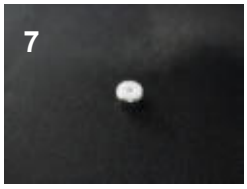
## Features

・Allows investigation of microreactions with minimum equipment

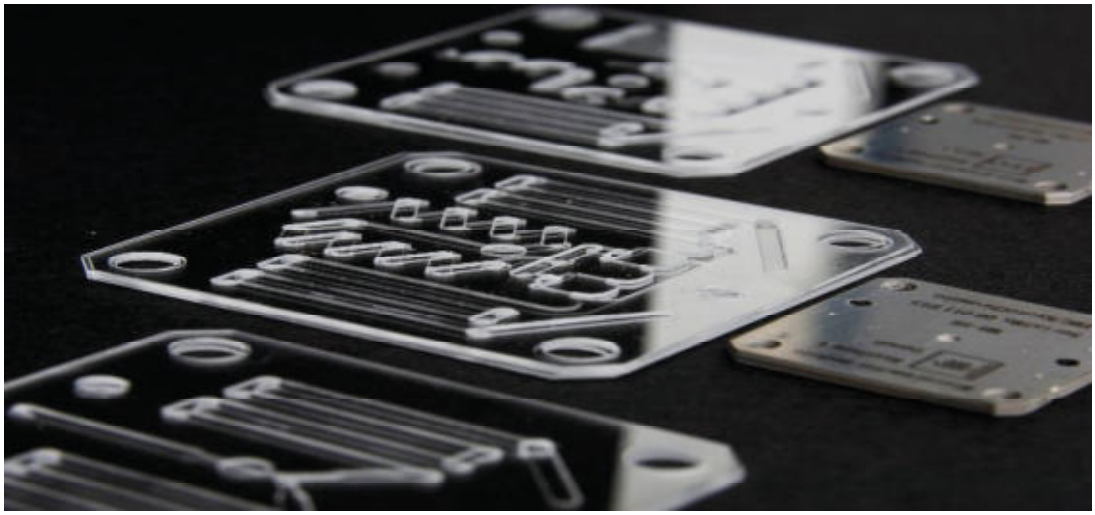
## Specification

| | | |
|---|---|---|
| Mixer unit | Mixer | Y type, Static type, Helix type |
| | Mixer material | Stainless steel 316, Hastelloy, Glass, PTFE |

## Parts detail




| | Product | Model number |
|---|---|---|
| 1 | KeyChem® Mixer Hadar (Y type) | KC-M-Y-SUS |
| 2 | KeyChem® Mixer Spica (Static type) | KC-M-S-SUS |
| 3 | KeyChem® Mixer Deneb (Helix type) | KC-M-H-SUS |
| 4 | Connector 1/16 inch PEEK・M6HN (3 connectors) | YMC-P-0002 |
| 5 | Connector 1/16 inch (pack of 10) ETFE | YMC-P-0006 |
| 6 | Syringe adapter (female type) (2 adapters) | YMC-P-0007 |
| 7 | Ferrule 1/16 inch (pack of 10) PTFE・GT | YMC-P-0012 |
| 8 | PTFE tubing (O.D.:1/16 inch, I.D.:0.5 mm, Length:10 m) | YMC-P-0025 |
| 9 | KeyChem® mixer housing | YMC-P-0030-01 |



- KeyChem® Mixer・Residence time unit
- CYTOS-200® Reactor・Residence time unit
- CYTOS-2000® Reactor・Residence time unit
- KeyChem®-Lumino Reactor

# Reactors・Residence time units

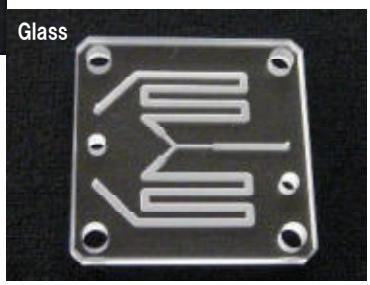
1 KeyChem® series Mixers

# Hadar (Y type)

**Model numbers see below**

Description

Simple Y-shaped channel design for entry-level microreaction research



Features

- Excellent heat exchange efficiency
- Suitable for entry-level to microreaction systems
- Adaptable for particle synthesis
- Suitable for reactions with acidic liquids (Hastelloy, Glass, PTFE)

Specification

| Size LengthxWidthxThickness(mm) | Volume(μL) | | Channel size Min. WidthxDepth(mm) | Material | Model number |
|---|---|---|---|---|---|
| | Preheating | Mixing | | | |
| 30x30x1.3 | 17 | 1.4 | 0.5x0.1 | SUS316 | KC-M-Y-SUS |
| 30x30x1.8 | 34 | 2.8 | 0.5x0.2 | Hastelloy | KC-M-Y-HC |
| 30x30x3.2 | 14 | 1.2 | 0.5x0.1 | Glass | KC-M-Y-G |
| 30x30x2.5 | 12 | 3.8 | 0.5x0.5 | PTFE | KC-M-Y-P |

PTFE : different channel design

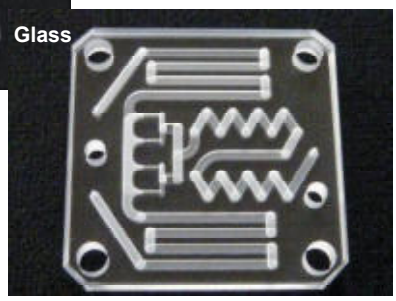
2 KeyChem® series Mixers

# Deneb (Helix type)

**Model numbers see below**

Description

Stirring mixer which has three dimensional spiral-like channel design


Features

- Suitable for organic synthesis
- Excellent heat exchange efficiency
- Suitable for reactions of acidic liquids (Hasttelloy, Glass)

Specification

| Size LengthxWidthxThickness(mm) | Volume(μL) | | Channel size Min. WidthxDepth(mm) | Material | Model number |
|---|---|---|---|---|---|
| | Preheating | Mixing | | | |
| 30x30x1.8 | 57 | 32 | 0.2x0.2 | SUS316 | KC-M-H-SUS |
| 30x30x1.8 | 39 | 22 | 0.2x0.2 | Hastelloy | KC-M-H-HC |
| 30x30x3.2 | 52 | 33 | 0.2x0.2 | Glass | KC-M-H-G |

PTFE : Please enquire.

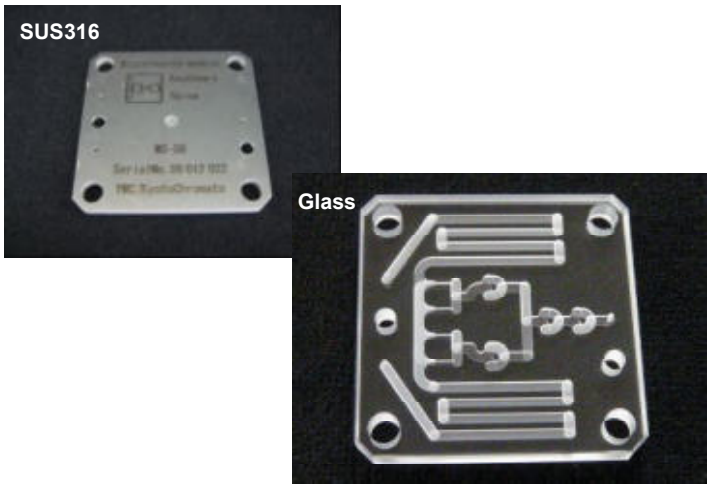
3 KeyChem® series Mixers

# Spica (Static type)

**Model numbers see below**

Description

Laminar flow mixer with a series of division and combination of flow occurs




Features

- Excellent mixing efficiency
- Suitable for reactions of acidic liquids (Hastelloy, Glass)

Specification

| Size LengthxWidthxThickness(mm) | Volume(μL) | | Channel size Min. WidthxDepth(mm) | Material | Model number |
|---|---|---|---|---|---|
| | Preheating | Mixing | | | |
| 30x30x1.8 | 57 | 20 | 0.2x0.2 | SUS316 | KC-M-S-SUS |
| 30x30x1.8 | 39 | 15 | 0.2x0.2 | Hastelloy | KC-M-S-HC |
| 30x30x3.2 | 56 | 16 | 0.2x0.2 | Glass | KC-M-S-G |

PTFE : Please enquire.

4 KeyChem® series Mixer

# Rigel (Y type RTU・SUS)

**Model number KC-MR4.5-Y-SUS**

Description

A reactor with a Y type mixer and a residence time unit (RTU) of 4.5 mL for organic reactions requiring longer reaction times


Features

- Compact design with combined mixer and RTU
- Requires only one Thermo Stage

Specification

| Size LengthxWidthxThickness(mm) | Volume (μL) | | | Channel size Min. WidthxDepth(mm) |
|---|---|---|---|---|
| | Preheating | Mixing | Residence | |
| 50x66x6.5 | 42 | 2.7 | 4,600 | 0.5x0.1 |

5 KeyChem® series Residence time units

# Sirius (SUS)

**Model numbers see below**

Description

Plate type RTU for longer reaction times.

A dedicated Thermo Stage is needed.

Features

・Three different volumes

・Excellent heat exchange efficiency due to stainless steel 316 construction


Photo : Sirius15

Specification

| Product name | Volume (mL) | Size LengthxWidthxThickness(mm) | Channel size WidthxDepth(mm) | Model number |
|---|---|---|---|---|
| Sirius15 | 1.5 | 50x66x3.7 | 2x0.6 | R006-50-S6 |
| Sirius30 | 3.0 | 50x66x5.1 | 2x1.3 | R005-50-S6 |
| Sirius45 | 4.5 | 50x66x6.5 | 2x2 | R004-50-S6 |

6 CYTOS®-200 series Reactors

# Sargas (Y type)

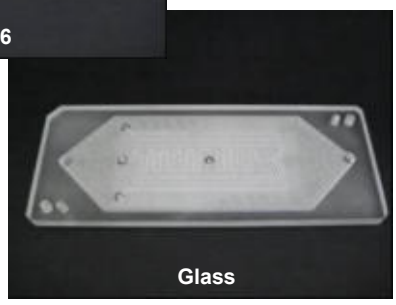
**Model numbers see below**

Discription

Y type reactor for CYTOS®-200 with internal heating zones.

Stainless steel unit has internal heat fluid circulation zones for wider temperature control range.

Glass unit is suitable for handling acidic liquids.


Features

・Simple Y-shape mixing

・Excellent heat exchange efficiency

・Wider range of temperature control by heat fluid circulation

Specification

| Size LengthxWidthxThickness(mm) | Volume (μL) | | Channel size Min. WidthxDepth(mm) | Material | Model number |
|---|---|---|---|---|---|
| | Preheating | Mixing | | | |
| 50x130x6.4 | 94 | 42 | 0.5x0.2 | SUS316 | C200-Y-SUS |
| 50x130x6.2 | 170 | 73 | 0.5x0.4 | Glass | C200-Y-G |

## 7 CYTOS®-200 series Reactor

# Regulus (CYTOS®-M type・SUS) Model number C200-M-SUS

Description

Original CPC design for CYTOS®-200 reactor with internal heat fluid circulation zones for improved temperature control

Features

・Excellent mixing

・Wider range temperature control by heat fluid circulation

・Excellent heat exchange efficiency

Specification

| Size LengthxWidthxThickness(mm) | Volume (μL) | | Channel size Min. WidthxDepth(mm) |
|---|---|---|---|
| | Preheating | Mixing | |
| 50x130x9.4 | 99 | 160 | 1x0.3 |

## 8 CYTOS®-200 series Residence time units

# Laminar & Capillary RTU

**Model numbers see below**

Description

Two versions (laminar and capillary) are available for longer reaction times.

Reaction time is controlled by flow rate

Photo : Capillary1.8

Features

・Three different volumes

・Excellent heat exchange efficiency

・Optional Hastelloy versions are available for acidic liquids.

・Laminar type has plate structure.

・Capillary type has tubular structure.

Specification

| Product name | Volume (mL) | Size LengthxWidthxThickness(mm) | Channel size Min. WidthxDepth(mm) | Material | Model number |
|---|---|---|---|---|---|
| Laminar0.9 | 0.9 | 50x130x8.2 | 2x0.2 | SUS316 | CYTOS200R0.9LCPC |
| Capillary0.9 | 0.9 | 50x130x30 | ϕ0.6 | SUS316 | CYTOS200R0.9CPC |
| Capillary1.8 | 1.8 | 50x130x40 | ϕ0.6 | SUS316 | CYTOS200R1.8CPC |
| Capillary4.5 | 4.5 | 50x130x55 | ϕ0.9 | SUS316 | CYTOS200R4.5CPC |
| Laminar0.9 | 0.9 | 50x130x8.2 | 2x0.2 | Hasttelloy | CYTOS200RHL0.9CPC |
| Capillary0.9 | 0.9 | 50x130x30 | ϕ0.6 | Hasttelloy | CYTOS200RH0.9CPC |
| Capillary1.8 | 1.8 | 50x130x40 | ϕ0.6 | Hasttelloy | CYTOS200RH1.8CPC |
| Capillary4.5 | 4.5 | 50x130x55 | ϕ0.9 | Hasttelloy | CYTOS200RH4.5CPC |

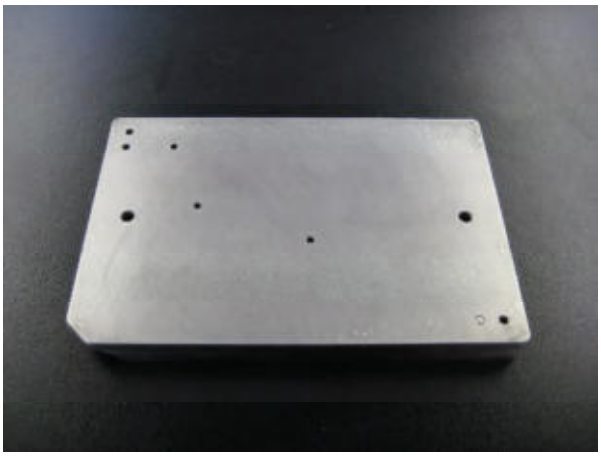
9 CYTOS®-2000 series Reactors

# Reactor (CYTOS®-L type)

**Model numbers see below**

Description

Original CPC design for CYTOS®-2000 reactor with internal heat fluid circulation zones for improved temperature control



Features

- Excellent heat exchange efficiency
- Optional Hastelloy versions available for acidic liquids.

Specification

| Size LengthxWidthxThickness(mm) | Volume (μL) | | Channel size Min. WidthxDepth(mm) | Material | Model number |
|---|---|---|---|---|---|
| | Preheating | Mixing | | | |
| 100x150x10.8 | 740 | 1,200 | 1x0.3 | SUS316 | C2000-M-SUS |
| 100x150x12.2 | 750 | 1,200 | 1x0.3 | Hasttelloy | C2000-M-HC |

10 CYTOS®-2000 series Residence time units

# Laminar & Capillary RTU

**Model numbers see below**

Discription

Two types (laminar and capillary) are available for longer reaction times

Features

- Two different volumes
- Excellent heat exchange efficiency
- Optional Hastelloy versions available for acidic liquids.
- Laminar type has plate structure.
- Capillary type has tubular structure.

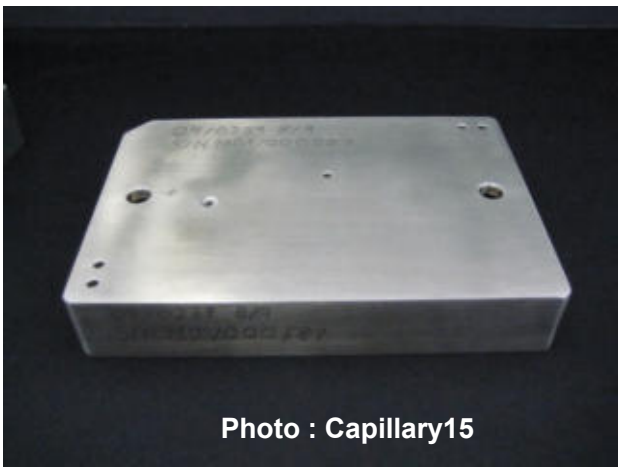


**Photo : Capillary15**

Specification

| Product name | Volume (mL) | Size LengthxWidthxThickness(mm) | Channel size Min. WidthxDepth(mm) | material | Model number |
|---|---|---|---|---|---|
| Laminar15 | 15 | 100x150x16.8 | 2x0.2 | SUS316 | CYTOS2000R15LCPC |
| Capillary15 | 15 | 100x150x25 | ϕ2 | SUS316 | CYTOS2000R15CCPC |
| Capillary60 | 60 | 100x150x50 | ϕ 2 | SUS316 | CYTOS2000R60CCPC |
| Laminar15 | 15 | 100x150x16.8 | 2x0.2 | Hastelloy | CYTOS2000RHL15CCPC |
| Capillary15 | 15 | 100x150x25 | ϕ 2 | Hastelloy | CYTOS2000RH15CCPC |
| Capillary60 | 60 | 100x150x50 | ϕ 2 | Hastelloy | CYTOS2000RH60CCPC |

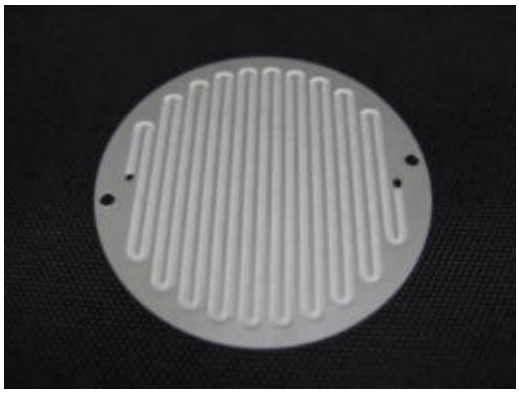
11 KeyChem®-Lumino Reactor

# Polaris (SUS)

**Model number KCL-M-SUS**

Description

Photoreaction reactor with 0.2 mm channel depth with excellent light irradiation efficiency



Features

- Excellent light irradiation efficiency
- Easy to be disassembled for cleaning

Specification

| Size DiameterxThickness(mm) | Volume (μL) | Channel size WidthxDepth(mm) |
|---|---|---|
| ϕ37.5x0.5 | 110 | 1x0.2 |

12 KeyChem®-Lumino Reactors

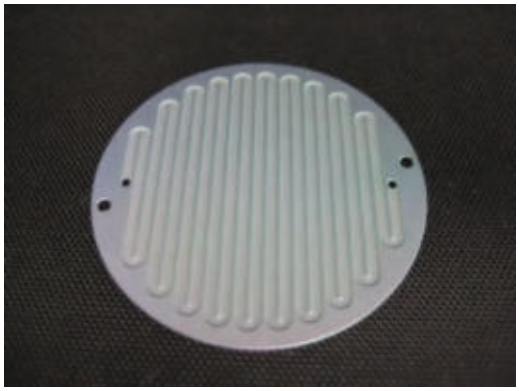
# Polaris ($TiO_2$)

**Model numbers see below**

Description

$TiO_2$ photocatalysis reactor

$TiO_2$ removal from the product is not necessary.



Features

- Suitable for photo $TiO_2$ catalysis experiments
- Can be disassembled for cleaning

Specification

| Size DiameterxThickness(mm) | Volume (μL) | Channel size WidthxDepth (mm) | Model number |
|---|---|---|---|
| ϕ37.5x0.5 | 84 | 1x0.15 | KCL-M-TiO2-015 |
| ϕ37.5x0.5 | 170 | 1x0.3 | KCL-M-TiO2-030 |
| ϕ37.5x0.8 | 280 | 1x0.5 | KCL-M-TiO2-050 |

C

# Thermostatic units

- Coupling type Thermo Stage
  （Low temperature version / High temperature version）
- Stand alone type Thermo Stage
  （Low temperature version / High temperature version）
- KeyChem®-Lumino Thermo Stage

1 KeyChem® series Thermostatic units

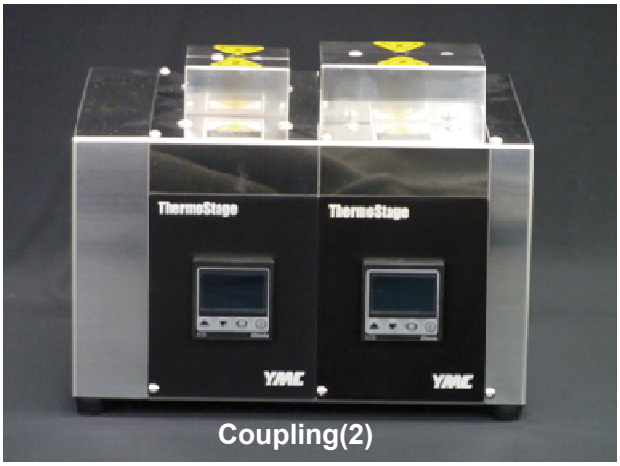
Model numbers see below

# Coupling Type Thermo Stage (Low temperature version)

Description

Utilizes Peltier temperature control so no heat fluid is required

Several Thermo Stages can be combined for several reactions and residence time units



Coupling(2)

Features

- Peltier temperature control
- Temperature control range -15 - 80 °C (for ambient temperature at 25 °C)
- Coupling of multiple units is possible.
- Oil-free operation (no heat fluid is not required.)

Specification

| | |
|---|---|
| Dimension | (WxDxH) 270x230x220 mm(excluding projection) |
| Power requirements | AC 100 - 240 V, 50/60 Hz, 400 W (Maximum power requirement for 4 unit operation) |
| Temp. Range | Thermo Stage(M-L), (R-L) -15 - 80 °C (for ambient temperature at 25 °C) |
| Accuracy | ±1 °C |
| Weight | Approx. 12 kg |

| Number of coupled Thermo Stages | Model number |
|---|---|
| Coupling(2) | TS2-C |
| Coupling(3) | TS3-C |
| Coupling(4) | TS4-C |

2 KeyChem® series Thermostatic units

Model numbers see below

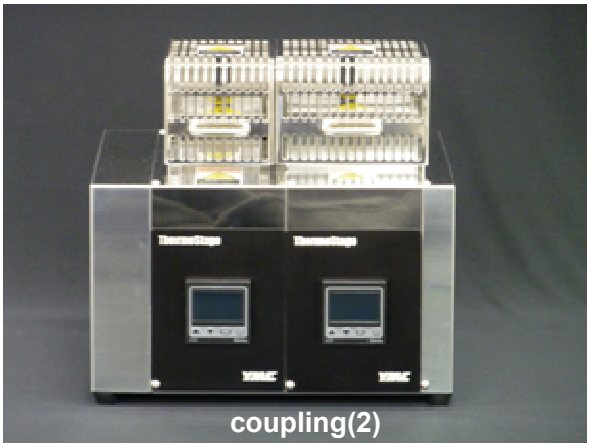
# Coupling Type Thermo Stage (High temperature version)

Description

Temperature control by electric heating

Heat fluid is not required.

Several Thermo Stages can be combined for several reactions and residence time units.



coupling(2)

Features

- Temperature control by electric heating
- Temperature range, ambient temperature - 150 °C
- Coupling of multiple units is possible.
- Oil-free operation (no heat fluid is required.)

Specification

| | |
|---|---|
| Dimension | (WxDxH) 270x230x255 mm (excluding projection) |
| Power requirements | AC 100 - 240 V, 50/60 Hz, 400 W (Maximum power requirement for 4 unit operation) |
| Temp. Range | Thermo Stage(M-H), (R-H) ambient temperature - 150 °C |
| Accuracy | ±1 °C |
| Weight | Approx. 12 kg |

| Number of coupled Thermo Stages | Model number |
|---|---|
| Coupling(2) | TS2-H |
| Coupling(3) | TS3-H |
| Coupling(4) | TS4-H |

3 KeyChem® series Thermostatic units (for KeyChem®-Basic) **Model numbers see below**

# Stand-alone Type Thermo Stage (Low temperature vertion)

Description

Peltier temperature control – no heat fluid required

Several Thermo Stages can be coupled for multiple reactions

Thermo Stage for RTU can also be added on.


Features

- Peltier temperature control
- Temperature control range -15 - 80 °C
  (for ambient temperature at 25 °C)
- Commercially available pumps can be connected.
- Oil-free operation (no heat fluid required.)

Specification

| | |
|---|---|
| Dimension | (WxDxH) 120x230x220 mm (excluding projection) |
| Power requirements | AC 100 - 240 V, 50/60 Hz, 100 W |
| Type | Peltier temperature control |
| Temp. Range | -15 - 80 °C (for ambient temperature at 25 °C) |
| Accuracy | ±1 °C |
| Weight | Approx. 4 kg |

| | Model number |
|---|---|
| Mixer | TS-C-M |
| RTU | TS-C-R |

4 KeyChem® series thermostatic units (for KeyChem®-Basic) **Model numbers see below**

# Stand-alone Type Thermo Stage(High temperature version)

Description

Temperature control by electric heater – no heat fluid required

Several Thermo Stages can be coupled for multiple reactions

Thermo Stage for RTU can also be added on.

Features

- Temperature control by electric heating
- Temperature range, ambient temperature - 150 °C
- Commercially available pumps can be connected.
- Oil-free operation (no heat fluid required.)

Specification

| | |
|---|---|
| Dimension | (WxDxH) 120x230x255 mm (excluding projection) |
| Power requirements | AC 100 - 240 V, 50/60 Hz, 100 W |
| Temp. Range | Ambient temperature - 150 °C |
| Accuracy | ±1 °C |
| Weight | Approx. 4 kg |

| | Model number |
|---|---|
| Mixer | TS-H-M |
| RTU | TS-H-R |

5 KeyChem® series Thermostat (for KeyChem®-lumino)

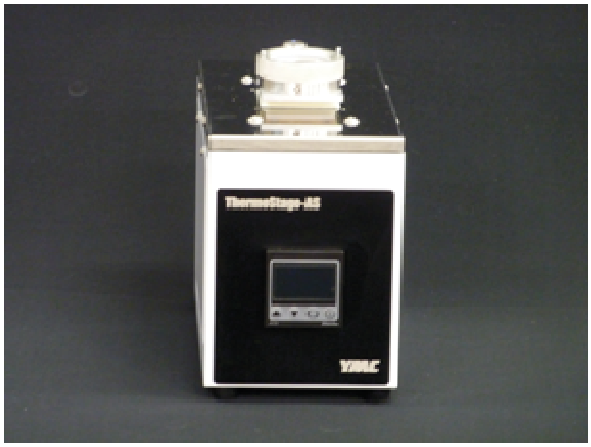
# KeyChem-Lumino Thermo Stage

**Model number TS-LU**

## Description

Dedicated thermostat for photoreaction.

A photoreaction reactor can be mounted



## Features

- Peltier temperature control
- Any light sources can be used.
- Oil-free operation (no heat fluid required.)

## Specification

| | |
|---|---|
| Dimension | (WxDxH) 120x230x205 mm (excluding projection) |
| Power requirements | AC 100 - 240 V, 50/60 Hz, 100 W |
| Type | Peltier control |
| Temp. Range | -15 - 80 °C (for ambient temperature at 25 °C) |
| Accuracy | ±1 °C |
| Weight | Approx. 4 kg |

■ MR2 Syringe pump

# D

# Pump

1-2 Microreactor Pump KeyChem®-L/CYTOS-200

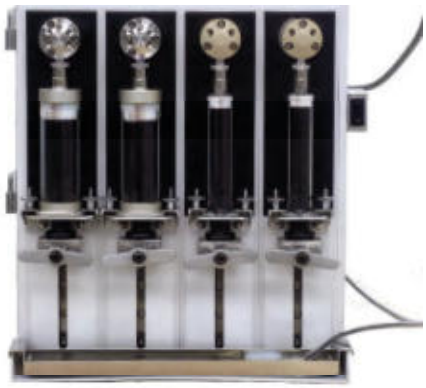
# MR2 Syringe pump

**Model numbers see below**

## Description

Top quality syringe pump with all the functions that are required for microreaction

It can use several makes of syringes such as Hamilton, KLOEHN or disposable units. Since each syringe unit can be removed independently, any number of syringes can be set up for an experiment.



Standard model

1-5 way valvex2

1-2 way valvex2

## Features

- Easy to mount/remove different brands of syringes
- Any number of syringes can be set up for an experiment
- Continuous flow is obtained by alternating delivery from two syringes.
- Full PC control

## Specification

| | |
|---|---|
| Dimension | (WxDxH) 230x350x280 (mm) |
| Power requirements | AC 100-240 V, 50/60 Hz, 300 W |
| Type | Syringe pump |
| Usable syringes | HAMILTON gas tight syringe(Luer lock type)<br>Volume : 1, 2.5, 5, 10, 25 mL |
| | HSW disposable syringe(Luer lock type)<br>Volume : 2(2.5), 5, 10, 20(18) mL *2, 20 mL The numbers in () are actual usage volumes. |
| | KLOEHN V6 syringe<br>Volume : 2.5, 5, 10, 25 mL |
| Flow rate range | approx. 0.7 μL/min - 55 mL/min *Depending on syringe size<br>(recommended flow rate range : 10 μL/min - 10 mL/min) |
| Flow rate accuracy | Within ±2% |

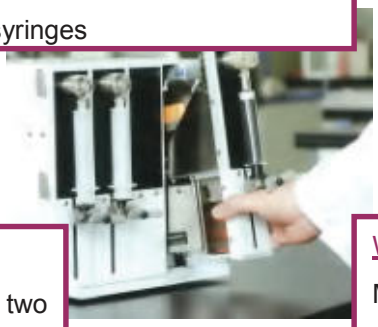
| Valve combination | Model number |
|---|---|
| 1-5 way valvex4 | MRSY04-40 |
| 1-5 way valvex2, 1-2 way valvex2 | MRSY04-22 |

With 1-5 way valvex2, 1-2 way valvex2

Rinsing can be done after reaction of two reagents.

Syringe units

Can set up any number of syringes



With 1-5 way valvex4

Mixing of four reagents or continuous flow of two reagents is possible


- Connectors
- Ferrules
- Regulator
- Filters
- T type reactor
- Tubing
- Reactor housing
- Parts
- Others

# Accessories-Consumable parts

1 Connectors

## Tubing connector 1/16 inch（pack of 10）Stainless steel

Description

Stainless steel connector, to be used with ferrules (model numbers YMC-P-0011, YMC-P-0012) for connecting 1/16 inch tubing to a valve.

| Material | Model number |
|---|---|
| SUS316 | YMC-P-0001 |

2 Connectors

## Tubing Connector 1/16 inch PEEK•M6HN

Description

PEEK connector to be used with ferrule（model number YMC-P-0013）for connecting 1/16 inch tubing to mixer housing.

| Material | Model number |
|---|---|
| PEEK | YMC-P-0002 |

3 Connectors

## Luer lock connector

Description

Luer lock connector for connecting a syringe to a valve

| Material | Model number |
|---|---|
| PTFE / gland<br>PCTFE / body | YMC-P-0003 |

4 Connectors

## KeyChem-L Tubing connector (Low temperature version)

Description

Tubing connector for connecting 1/16 inch tubing to thermostat of KeyChem®-L（Low temperature version）

| Material | Model number |
|---|---|
| POM | YMC-P-0004 |

5 Connectors

## KeyChem®-L Tubing connector (High temperature version)

Description

Tubing connector for connecting 1/16 inch tubing to thermostat of KeyChem®-L（High temperature version）

| Material | Model number |
|---|---|
| PEEK | YMC-P-0005 |

6 Connectors

## Connector 1/16 inch (pack of 10)　ETFE

Description

Connector for attaching 1/16 inch tubing to the syringe connectors (model number YMC-P-0009 and model number YMC-P-0010）with 1/16 inch tube.

| Material | Model number |
|---|---|
| ETFE | YMC-P-0006 |

7 Connectors

## EASYFITT10ϕ (pack of 10)

Description

Connector with built-in ferrule for 1/16 inch tubing.

| Material | Model number |
|---|---|
| PEEK | YMC-P-0009 |

8 Connectors

## Housing connector (Stainless steel tubing version)

Description

Connector for connecting 1/16 inch stainless steel tubing to the KeyChem® Mixer housing (Model number YMC-P-0030-01, and model number YMC-P-0030-02 ） requires ferrule (model number YMC-P-0001 and YMC-P-0011).

| Material | Model number |
|---|---|
| SUS | YMC-P-0057 |

9 Adapter

## Syringe adapter（female type）

Description

Adapter for connecting 1/16 inch tubing to a syringe (Luer lock type) using Connector 1/16 inch (Model number YMC-P-0006)

| Material | Model number |
|---|---|
| ETFE | YMC-P-0007 |

10 Adapter

## Luer adapter（male type）

Description

Adapter to be used with Connector 1/16 inch (Model number YMC-P-0006) for connecting a syringe needle for air sensitive reactions

| Material | Model number |
|---|---|
| ETFE | YMC-P-0008 |

11 Ferrules

## Ferrule 1/16 inch (pack par 10) PTFE

Description

Ferrule for use with connector (model number YMC-P-0001）for connecting tubing to a valve

| Material | Model number |
|---|---|
| PTFE | YMC-P-0010 |

12 Ferrules

## Ferrule 1/16 inch (pack par 10) Stainless steel

Description

Ferrule for use with connector (model number YMC-P-0001）for connecting tubing to a valve

| Material | Model number |
|---|---|
| SUS316 | YMC-P-0011 |

13 Ferrules

## Ferrule 1/16 inch (pack par 10) PTFE•GF

Description

Ferrule for use with connector (model number YMC-P-0002, -0004, -0005, -0006）for connecting tubing to a valve

| Material | Model number |
|---|---|
| PTFE/SUS316 | YMC-P-0012 |

14-16 Back-pressure regulators

## Back pressure regulator

Description

Regulator to be installed at the outlet of a reactor to increase pressure in the system

| Material | Back pressure | Model number |
|---|---|---|
| PEEK | 5 psi (0.03 MPa) | YMC-P-0013 |
| | 20 psi (0.14 MPa) | YMC-P-0014 |
| | 40 psi (0.28 MPa) | YMC-P-0015 |

17 In-line check valve

## In-line check valve

Description

Check valve to be mounted at the inlet of a reactor to prevent reverse flow.

| Material | Proof pressure | Model number |
|---|---|---|
| PEEK, gilding SUS, perfluorelastomer, tefzel | 6.9 MPa | YMC-P-0052 |

18 Filters

## In-line filter set (includes 10 filters)

Description

Filter to be mounted at the inlet of a reactor

| Material | Size of bore | Model number |
|---|---|---|
| PTFE | 25 μm | YMC-P-0016 |

19-20 Filters

## Suction filter

Description

Suction filter for use on the suction side of a pump

| Material | Model number |
|---|---|
| PP | YMC-P-0017 |
| SUS | YMC-P-0018 |

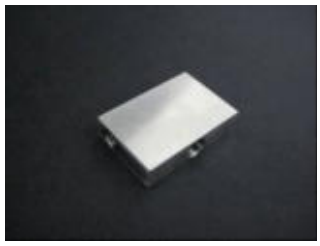
21-22 For Microreactor

## T type reactor (Stainless steel)

Description

T-tube reactor

| I.D.（mm） | Material | Model number |
|---|---|---|
| 0.5 | SUS316 | YMC-P-0019 |
| 1.0 | | YMC-P-0020 |



23-25 For Microreactor

## T type reactor (PEEK)

Description

T-tube reactor made from PEEK

| I.D.（mm） | Material | Model number |
|---|---|---|
| 0.25 | PEEK | YMC-P-0021 |
| 0.5 | | YMC-P-0022 |
| 1.0 | | YMC-P-0023 |

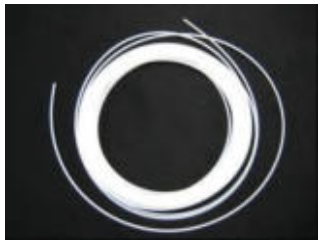
26-29 Connecting tubing

## PTFE tubing

Description

Tubing for connecting various modules in a microreactor

| I.D. (mm) | Material | O.D. | Length | Model number |
|---|---|---|---|---|
| 0.25 | PTFE | 1/16 inch | 10 m | YMC-P-0024 |
| 0.5 | | | | YMC-P-0025 |
| 0.75 | | | | YMC-P-0026 |
| 1.0 | | | | YMC-P-0027 |



30-31 Connecting tubing

## Stainless steel tubing

Description

Tubing for connecting various modules in a microreactor

| I.D.（mm） | Material | O.D. | Length | Model number |
|---|---|---|---|---|
| 0.5 | SUS316 | 1/16 inch | 10 m | YMC-P-0028 |
| 1.0 | | | | YMC-P-0029 |

32 For KeyChem®

## KeyChem® Mixer housing

Description

Mixer housing for KeyChem®

Simple experiments can be done with a KeyChem® mixer and commercially available thermostats such as oil or water baths.

One version is transparent for internal observation (YMC-P-0030-02)


YMC-P-0030-02

| Material | Model number |
|---|---|
| aluminum (A5052) | YMC-P-0030-01 |
| | YMC-P-0030-02 |

33 For KeyChem®

## KeyChem® Mixer housing (Acrylic)

Description

Acrylic mixer housing for KeyChem®（A sister product of YMC-P-0030）

Transparent for internal observation

| Material | Model number |
|---|---|
| Acrylic | YMC-P-0031 |

34 For KeyChem®

## KeyChem® Residence time unit housing

Discription

Housing for KeyChem® residence time units

| Material | Model number |
|---|---|
| Aluminum（A5052） | YMC-P-0032 |

### 35 For CYTOS®-200

## CYTOS®-200 Reactor housing

Description

Housing for CYTOS®-200 Reactor

| Material | Model number |
|---|---|
| Aluminum (A5052) | YMC-P-0033 |

### 36 For CYTOS®-200

## CYTOS®-200 Clamping unit

Description

Clamping unit for CYTOS®-200 Reactor

| Model number |
|---|
| YMC-P-0034 |

### 37 For KeyChem®-Lumino

## KeyChem®-Lumino Reactor housing

Description

Housing for KeyChem®-Lumino Reactor

| Part | Material | Model number |
|---|---|---|
| Cover | Aluminum (A5052), Quartz glass | YMC-P-0035 |
| Gland | PTFE | |
| Base | SUS316 | |

### 38-41 For MR2 pump

## Hamilton Syringe attachment kit for MR2 pump

Description

Attachment kit for mounting a Hamilton syringe onto MR2 pump

| Type | Model number |
|---|---|
| 1 mL / 2.5 mL | YMC-P-0036 |
| 5 mL | YMC-P-0037 |
| 10 mL | YMC-P-0038 |
| 25 mL | YMC-P-0039 |

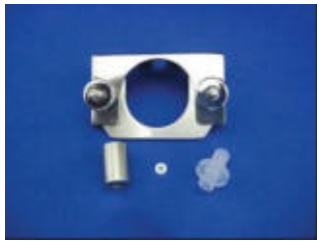


Photo : 25 mL type

42-45 For MR2 pump

# Disposable Syringe attachment kit for MR2 pump

Description

Attachment kit for mounting a disposable syringe onto MR2 pump

| Type | Model number |
|---|---|
| 2 mL | YMC-P-0040 |
| 5 mL | YMC-P-0041 |
| 10 mL | YMC-P-0042 |
| 20 mL | YMC-P-0043 |

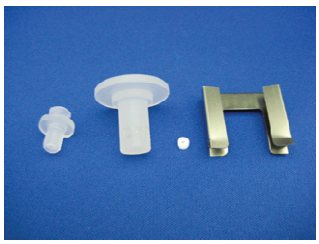


Photo : 20 mL

46 For MR2 pump

# KLOEHN Syringe attachment kit for MR2 pump

Description

Attachment kit for mounting a KLOEHN syringe onto MR2 pump

Suitable for 2.5 mL, 5 mL, 10 mL, 25 mL syringes

| Model number |
|---|
| YMC-P-0044 |

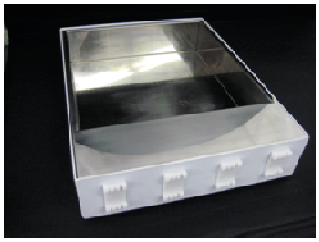
47 For MR2 pump

# Reservoir base for MR2 pump

Description

Tray to be installed on the top of MR2 syringe pump for storing regent bottles

| Model number |
|---|
| YMC-P-0045 |



48 For MR2 pump

# Reservoir base with pressure meter for MR2 pump

Description

Tray to be installed on the top of MR2 syringe pump for storing reagent bottles, complete with pressure meter

| Model number |
|---|
| YMC-P-0046 |

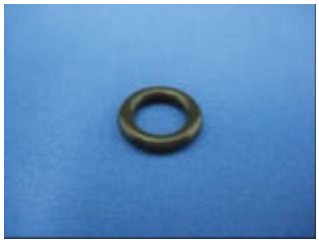
49 For CYTOS®

## O-ring for CYTOS® (Heating fluid line)

Description

O-ring for CYTOS® micro-reactor heat fluid tubing

| Material | Model number |
|---|---|
| Fluoro-rubber (FPM) | YMC-P-0047 |



50 For CYTOS®

## O-ring for CYTOS® (Reaction line)

Description

O-ring for CYTOS® micro-reactor reaction tubing

| Material | Model number |
|---|---|
| Perfluoroelastomer | YMC-P-0048 |

51 Others

## STACKING DRY BATH

Description

Oil-free dry heating bath for round bottomed flasks, suitable for 50, 100, 250, 500, 1000 mL flasks

Can be used on the standard 135 mm heater/stirrer

Conforms to JIS (Japanese Industrial Standards)

| Model number |
|---|
| DRYBATH |

52 For KeyChem®-Lumino

## UV light source unit (365 nm)

**Model number YMC-P-0049**

Description

Light Source for KeyChem®-Lumino with 6 LEDs in light emitting unit

| | |
|---|---|
| Light type | Ultraviolet emitting LEDs |
| Peak wavelength | 365 nm (25 °C) |
| Life time | 500 hours in continuous operation |
| Light power | Max. 250 mW (each) |
| Power requirements | AC 100 - 240 V, 100 W |
| Dimensions | (WxDxH)<br>Light emitting unit : 55x57x40 mm<br>Power source unit : 50x250x161 mm |

53 For KeyChem®-Lumino

**Model number YMC-P-0050**

## Low pressure mercury lamp for KeyChem®-Lumino(254 nm)

Description

Light source for KeyChem®-Lumino with 2 lamps in light emitting unit

| | |
|---|---|
| Light type | Low pressure mercury lamp |
| Peak wavelength | 254 nm |
| Life time | adv. 30000 hours |
| Light intensity | 70 μW/cm$^2$/10 cm |
| Power requirements | AC 100 - 240 V, 18 W |
| Dimensions | (WxDxH)<br>Light emitting unit : 57x100x45 mm<br>Power source unit : 50x64x26.5 mm |

54 For KeyChem®-Lumino

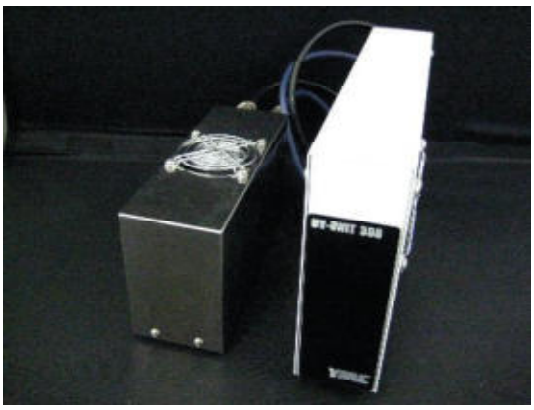
**Model number YMC-P-0051**

## Excimer lamp for KeyChem®-Lumino (308 nm)

Description

Excimer light source for KeyChem®-Lumino

| | |
|---|---|
| Light type | Excimer lamp |
| Peak wavelength | 308 nm |
| Life time | adv. 1000 hours |
| Power requirements | AC 100 V, 20 W |
| Dimensions | (WxDxH)<br>Light emitting unit : 63x180x99 mm<br>Power source unit : 50x250x161 mm |



Please enquire about other lamp.