

# Life Science – Micro Reactor Technology

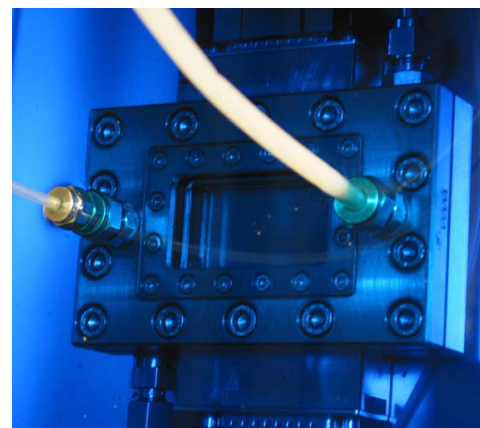
Application note A016C-LS05R01-0611B



Due to the needs for higher yields, enhanced efficiency, improved safety and minimized environmental risk, nowadays the Pharmaceutical Industry seeks alternatives to the conventional batch reactors; therefore, the industry trend is to adopt micro reactors as an alternative method especially for organic synthesis of extremely exothermic (im)miscible fluids.

Aware of these demands, Bronkhorst High-Tech has successfully developed innovative solutions dedicated to meet Micro Reactor Technology standards..

## ◆ Pills



Micro reactor

## Application requirements

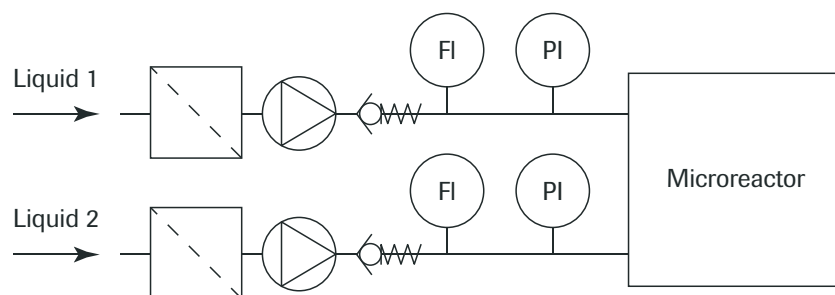
Pilot process development requires new generation liquid dosing systems for direct mass flow measurement/control. Such systems must be highly stable (very low pulsation in flow) and highly accurate. The dosing unit should be a plug and play component (pump

controlled by a mass flow instrument) with the possibility to adjust PID settings.

### Important topics

- ◆ Easy to use
- ◆ No need to pressurise liquid source
- ◆ Direct mass flow measurement control
- ◆ Mass and volume dosage possible

## Process solution



A schematic drawing from a process with a liquid dosing system and a micro reactor.

### Application description

Micro reactors are continuous reactors with extremely small physical size. These configurations are used to enhance the surface-to-volume ratio hence to improve heat transfer and increase selectivity. Such sizes are suitable for pilot scale reactions but this solution can be transposed to production scale capacity as well by combining multiple reactors operating parallel to each other. Due to its features these alternative reactors are very convenient, because a superior control and optimal use of reagents is achieved. Since all the process takes place in a closed system, toxic, hazardous or explosive chemicals can be used without raising severe safety and environmental issues. Given that the micro reactors have exceptionally small sizes, extremely subtle flows are involved, thus to achieve an optimal process, appropriate peripheral flow controllers and dosing systems will be required. One of the solutions developed by BHT involves the use of our unique flow sensor of the LIQUI-FLOW® or CORI-FLOW® series with controlling function, a gear pump, a filter, a check valve and all interconnecting material. ▶

The advantage of this setup is the possibility to have a stable and accurate liquid flow without gas bubbles. Additionally the system is suitable for several dissimilar liquids due to the Coriolis measuring principle. The attained results have been highly satisfactory and overcome the ones found in ordinary systems; hence this solution is being embraced by chemists who need to focus on micro-reactions. ■



## Recommended Products



### mini CORI-FLOW M14

mini CORI-FLOW M14 Coriolis flowmeter for ranges of 30 g/h...30 kg/h and additional density and temperature output; analog signals and RS232 are standard; fieldbus communication is optional (e.g. Profibus-DP, Modbus, DeviceNet, Flow-Bus).

- ◆ accuracy: 0.2% reading +/- zero stability
- ◆ SS316L wetted parts, all metal
- ◆ no moving parts
- ◆ temperature: 0...70 °C
- ◆ alarm and totalizer facilities
- ◆ fast response (up to 50 msec.)
- ◆ easily re-rangeable for different flow rates
- ◆ power: +15..24Vdc ; pressure: up to 200 bara
- ◆ IP65; ATEX zone 2, cat 3.



### EL-PRESS

The EL-PRESS series electronic Pressure Meter from Bronkhorst High-Tech has a well-proven compact thru-flow design and is available in pressure ranges from 2...100 mbar up to 8...400 bar.

- ◆ high accuracy and repeatability
- ◆ high pressure capability up to 400 bar
- ◆ suitable for gases and liquids
- ◆ optional metal sealed and down-ported constructions
- ◆ standard analog 0...5(10) V / 0(4)...20 mA and digital RS232 communication
- ◆ optional fieldbus interface (DeviceNet™ / PROFIBUS-DP® / Modbus / FLOW-BUS)

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### Micro Reactor Technology

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LS : Life Science  
 05 : Pharmaceutical  
 R01 : Reactor/Micro reactor