INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
Powai, Mumbai 400076

Purchase Requisition No. 1000013109 (SRM/RFX No. 6100000300)

Technical specifications for Flow Pump Reactor

System shall be modular in nature, allowing the future addition of extra functionalities and modules, each module capable of being integrated seamlessly into the system. Modules should be able to be stacked one upon another (within reasonable limits) to minimize the laboratory space required.

Support and Application Facilities

1. The supplier must have a dedicated Support capability, to assist in any query relating to operation of the system or specific hardware or software issues arising from use.
2. The supplier must have a global support team of at least 7 people covering all subsidiary companies globally to assist in helping the customer.
3. The supplier must have a dedicated Applications team of at least 4 people to answer specific questions and queries relating to flow chemistry
4. The supplier must have a global sales presence.

Automated Operation

1. System should be completely automated for carrying out walk-away synthesis. This means it should have a complete software control system for setting up various experimental parameters including reaction temperature, pressure, flow rates, relative molar concentrations, collection volume, rinse volumes, etc.) which are then executed by the system.
2. The software control system should be completely intuitive with an easy to use icon driven solution for devising fluidic networks.
3. System should allow both manual control and full experimental control within PC software
4. System should allow full manual control of each parameter on the system itself without PC software including ability to set flow rates, change temperature, pressure, injection and collection.
5. A system controller shall run the Automation Software under Microsoft Windows 10, 32 bit.
6. All Experimental data shall be stored in log files readable by MS Windows Office Excel or .csv format.

7. Real-time visualisation of data shall be available to indicate flow rates, target flows rates, reactor temperature, target reactor temperature, pressure, target pressure, collection cycles, completed experiments, outstanding experiments, run times, etc.
8. System should be able to import experimental parameters from MS Windows Office Excel or .csv format.
9. Each Module of the system may also be controlled manually as a stand-alone item, or controlled in a manual mode from the automation software when integrated in the system.

Pumping Channels

1. Each pump should have two independent fluid channels, capable of pumping different fluids with independent control of each channel.
2. Each pump channel should be based on the syringe pump principle wherein the fluid is pushed into the downstream system from two syringes which function in a continuous reciprocating non-pulsating fashion.
3. Each pump channel should have the capability of automatically filling the syringes from a reservoir, such that continuous uninterrupted flow can be assured.
4. System will never require manually priming of the pumps prior to use with the use of a syringe or other device.
5. The pump should have a Safety Shutdown mechanism that allows shutdown in the case of high pressure, the value being selected by the operator. One channel, both channels or all pump channels can be shutdown as desired.
6. The pump must be able to handle the continuous pumping of volatile solvent and reagents such as dichloromethane and ethers with no potential for cavitation within the pump.
7. In order to allow pumping of ‘difficult fluids such as Dichloromethane or viscous materials the aspiration rate of each pump channel may be adjusted independently of the dispensing rate. This control is a function of aspiration speed and positive pressure from the fluid reservoir.
8. The pumps should never stop if an air bubble is introduced to the pump
9. The pumps should be resistant to strong acids, strong bases and organic solvents.
10. Each pump channel shall be capable of pumping at flow rates between 1 uL/min and 10mL/min. Pump channels shall operate with a precision of not greater than 1% of the total syringe volume.
11. The pressure sensor for each channel should have the function to tare it’s pressure reading by a simple command.
12. The pump should have the function to perform an Automatic leak test to check the fluidic pathway is fully sealed.
13. The fluid reservoirs shall be capable of being kept under inert atmosphere and under controlled pressure.
14. The automation software shall allow the incorporation of multiple pumps.
15. The system should have all the appropriate tubing and cables to connect the various modules.

Reactors

1. The system shall be capable of using glass microreactors, tube reactors and solid phase column reactors.
2. The automation software shall allow the use of 'custom' reactors.
3. Tube reactors shall have volumes of 4mL and 16mL and be constructed of PTFE or 316 L Stainless Steel tubing (c276 Hastelloy as special option)
4. Each Tube Reactor can be heated from -100°C up to 250ºC.using suitable Heater/Cooler
5. Glass Microreactors shall be constructed with volumes of 62.5 uL, 250uL and 1,000uL. They shall have 2 or 3 inlets and 1 outlet.
6. Solid phase column reactors shall be provided having volume of , 12mL capable of being heated to 150ºC.(Optional Volume: 0.7mL2.4mL,5.6mL,)
7. An option to use quartz microreactors of 62.5uL and 250uL.shall be available.

Reactor Temperature Control

1. The system shall be capable of operating in complex interconnected flow patterns that can be quickly and easily reconfigurable.
2. The flow reactor platform must easily be configured for telescoped / concatenated multi-step organic syntheses. That is, the computer system must be able to control more than one reactor in series.
3. The system shall be provided with heating modules(Heating by conduction, No air Heating) for tube reactors, microreactors and tube reactors.
4. The system shall be provided with heating/cooling modules for microreactors.
5. Heating and cooling modules capable in a range of -15ºC to 150 ºC for glass microreactors. (**No external Dry Ice or Liq Nitrogen needed)**
6. The use of cooling modules capable in a range of -70ºC to ambient for tube reactors.**. (No external Dry Ice or Liq Nitrogen needed)**

Pressure Control **(VARIABLE BPR)**

1. The system should have a variable back pressure controller to control the pressure from 1 to 20 bars with 0.1 bar resolution.
2. The back-pressure controller should allow for easy assembly and disassembly to facilitate cleaning, without the use of tools.
3. The back-pressure controller shall be driven by compressed gas or air.
4. The back-pressure controller should consist of a glass microfluidic device.
5. The back pressure controller should not be related to a spring/cap device similar to those used on LC devices.

Warranty: 24 months warranty from the date of Installation or from the date of shipment whichever is Earlier.