

Chemical Synthesis made easy*

Modular Synthesis Laboratory utilises Automated Reactors

By using reactors connected in parallel it becomes possible to significantly reduce the time factor for single synthesis operations. Additionally the costs are already minimised during the development phase. Each individual reactor unit is equipped to perform a complete range of basic operations required in a preparative laboratory environment, whilst operating independently.



4-units FlexyLab with additional 3rd dosage for each reactor

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Modular Synthesis Laboratory utilises Automated Reactors

Whenever a new product is developed or a process needs optimisation it is necessary to perform a whole series of experiments. Although automation has entered normal laboratory practice, an enormous backlog exists in the chemical synthesis area. A solution is now offered with the FlexyLab automated laboratory reactors made by the Swiss manufacturer Systag. It is now possible to synthesise products in a laboratory under near production conditions.



The system is based on Windows software and automated laboratory reactors. The flexibility of the system is demonstrated by the temperature control function which completely independently controls each reactor unit connected to the system. Temperature differentials between individual systems may vary up to 200K. Depending on requirements it becomes possible to operate above or below ambient temperature with and without cooling.

Only a single cooling system is required, servicing a number of reactor units. It is, however, recommended to connect a high performance cryostat when operating at low temperatures. The cryostat is operated by a central measuring and control system. This enables the introduction of further functions like emergency cooling or a safety monitoring program with alarm signals. When carrying out reactions at

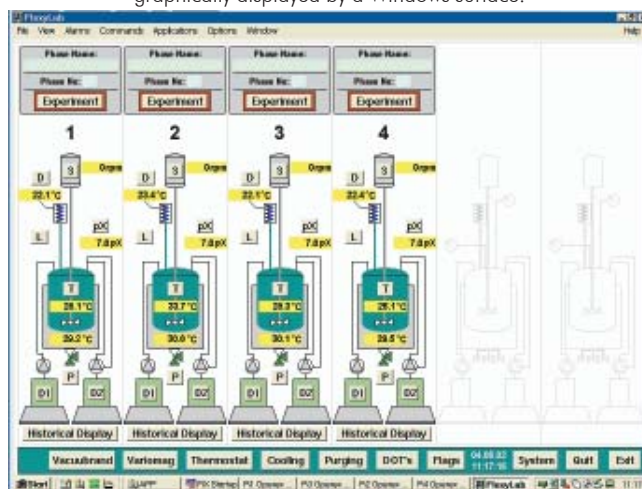
temperatures above ambient, ordinary mains water may be used as a cooling medium. As the reactors are constructed from glass it is easy to visually obtain information of the behaviour of a chemical reaction.

Integrated Weighing Platform allows simultaneous Double Dosing Process

Each individual reactor unit is capable of performing up to two dosing operations simultaneously. The integrated weighing platforms allow, in conjunction with both peristaltic pumps simultaneous gravimetric dosing of two different solvents or reagents. The reagents are continuously dosed at accurately controlled volumes at different addition rates. A selection of tubing materials is available for all commonly used chemicals. The operator determines individually the most suitable stirrer speed for each reactor system. The stirrer motor is designed with sufficient power to reliably mix even viscous liquids.

The handling of 250ml portable reactor is extremely simple. The reactor is removed from the system or used for the next following experiment.

The recipes, or individual basic operations are graphically displayed by a Windows surface.



The cumbersome filling and emptying of heating or cooling medium becomes superfluous due to the use of a reactor system consisting of only two components and a hermetically sealed heating or cooling jacket. No more messy dripping of the heating/cooling medium. For discharge or cleaning operations, the reactor is simply removed from the reactor unit, rinsed manually or placed in a dishwasher. A damaged reactor vessel can quickly be exchanged for a new one. Standard laboratory apparatus such as reflux condensers, distillation columns or water separators are easily attached to a glass fitting.

The start up of initial experiments requires little effort. From the main menu a parameter window for each reactor can be opened by mouse click. The parameters for temperature, dosing rate, or stirrer speed are entered and the experiment can be initialised. There is an option to change defined para-

4-units FlexyLab Fast Track with 100 ml reactors and 4 Lasentec Particle Size Analyzer probes



Reactor with mid-IR Fibre Optics, multiple dosages and vacuum distillation with reflux splitting



meters at any stage, or to terminate the experiment. Any observations made during the execution of the experiment, or manual additions must be recorded immediately. A protocol function, for entering text and automatic recording of date, time and the most important measured values is available. This option allows, in addition to the recording of data, the compilation of a laboratory report for each individual experiment.

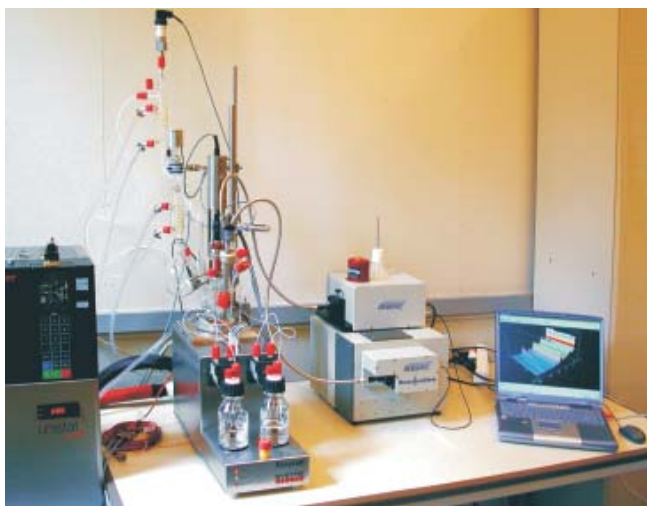
Alarm Function for Unsupervised Night Operation

Each reactor unit is equipped with an individual recipe control. Regardless whether several experiments are required to start simultaneously or not depends on the application requirements. Existing recipes can be quickly modified by simply changing parameters, adding or deleting basic operations to fit these new requirements. This greatly reduces the effort for setting up each experiment. The basic operations for temperature controlled dosing and emergency alarm functions allow for an unsupervised night operation. It is, however, still possible to manually override the fully automatic recipe operation, change parameters or abort phases. In addition to control functions for temperature control, dosing or stirrer speed control a number of further options are available: If it is required to wait for a certain step within the recipe

(i.e. when reaching a certain temperature) the basic operation function "If...then...else" can be used. This enables the operator to change the course of a recipe on the strength of certain values obtained during the process.

The "Hold" function is, for instance, available if the operator is expected to perform a certain task at a predetermined point in time, for example to periodically take a sample from the reaction medium, or if the manual addition of a catalyst is required. By using this function it is ensured that an action taken at a certain point in time is not subject to external influences. The "Timer" function provides the introduction of a reproducible waiting period at any point in time.

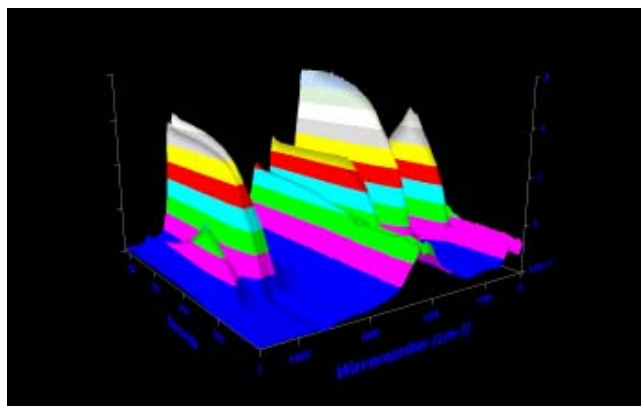
1 unit FlexyLab with mid-IR Fibre Optics FTIR



Reliable Recording during the Course of an Experiment

A complete record of all raw data is obtained for the complete duration of the experiment. An individual trend graph is available of each reactor unit. A project management tool is available

mid-IR layer display of an alcoholysis with Fibre Optics FTIR



to allocate data recorded over extended time periods accurately and clearly to an experiment. Archiving of data in external databanks is also possible.

The interpretation of serial experiments using varying parameters becomes more complex as more sequential experiments are carried out. The graphic tool SysGraph has been created to depict several experiments in a single diagram or to compare several graphs against each other.

Historical Display of h-files (trend graph)
Historical data files: FDA approved

