SYSTAG
automatically better

FlexyCLAVE

The automated hydrogenation solution



What is the FlexyCLAVE?

The FlexyCLAVE is a fully automated turnkey solution for hydrogenations or other types of gas reactions. The FlexyCLAVE includes the entire hardware for gas dosing and pressure control, as well as the intuitive FlexySys recipe software. FlexySys also controls all the components connected to the reactor, such as thermostats, stirrer motors, pumps and scales. At the same time, all the parameters are recorded and an automatic laboratory journal is compiled. Thanks to the integrated recipe mode of operation, experiments can also be carried out unattended, or even overnight. The FlexyCLAVE is the solution for increasing the productivity of hydrogenations and it does this with a higher level of safety, security and reproducibility.

Advantages

+ Full automation thanks to recipe control

Predefined process steps allow hydrogenations to be carried out precisely, reproducibly and safely. Moreover, processes can be easily scaled up from the laboratory to the pilot plant with the aid of standardized steps..

+ Flexibility

Further functions such as liquid dosing, spectroscopy measurements or calorimetric analyses can also be integrated at a later stage. Other gases, such as CO, CO_2 or ethylene, can be dosed as well.

+ Safety

Sophisticated alarm and monitoring functions permit the system to operate even when unattended. In addition, automated leakage tests and gas leak detectors detect any leaks in the reactor system at once.

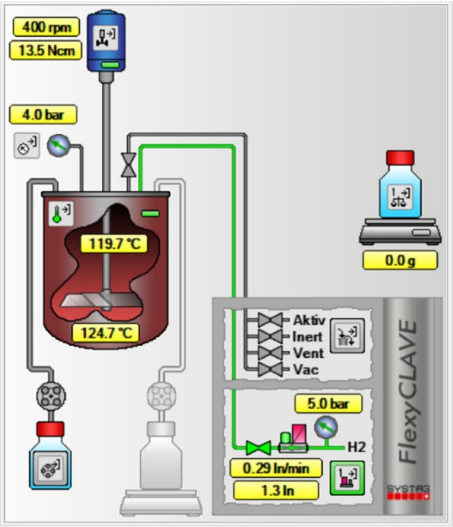
+ Traceability

Every process parameter, intervention and result is completely and automatically documented in accordance with CFR 21 part 11. Meaningful reports and graphics to optimise your laboratory journal can be created with just a few clicks.

Of conviction

FlexyCLAVE is THE solution for successful chemical process development in the field of hydrogenation.

Options and possibilities



Your hydrogenation system

Normally, a complete hydrogenation reactor consists of the following components:

1. Pressure reactor
2. Stirrer motor
3. Temperature control unit
4. Gas dosage
5. Pressure control
6. Data logger

Pressure reactor

The FlexyCLAVE is not bound to a specific type of reactor. This means that reactors, whether new or old and from any manufacturer, can be operated using the FlexyCLAVE, regardless of the reactor volume.

Stirrer motor

A wide variety of stirrer motors can be integrated with the FlexyCLAVE. Motor models from IKA, Heidolph or Büchiglas (Cyclone) are often used in laboratory applications. A “frequency converter” option is available for larger reactors with three-phase motors.

Temperature control unit

Particular attention needs to be paid to temperature control, especially with hydrogenations. The FlexyCLAVE integrates the following thermostats for regulating the temperature of double jacketed reactors:

+ Huber
+ Julabo
+ Lauda

Electrically heated reactors can also be comfortably regulated with the FlexyCLAVE.

Gas dosage and pressure control

Gas exchange function

The gas exchange function is needed for conditioning the reactor. For instance, the number of cycles and the pressures for flushing with inert or active gas can be defined.

Gas dosing function

The actual dosing of active gas is the core function of any hydrogenation. The reaction may be carried out either by constant gas dosing (mln per min), or as pressure regulation. Both modes record the current gas consumption of the hydrogenation process.

End of reaction

The reaction can be ended manually or through one of the following termination criteria:

+ Defined volume
+ Defined flow rate undershot
+ Defined time

Scope of supply / specifications

FlexySys software

+ Recipe control
+ Data recording and electronic laboratory journal

FlexyCLAVE hydrogenation unit

+ 4 x el/pneumatic valves for active and inert gas, as well as for vacuum and ventilation
+ MFC for gas dosing up to 64 bar, 10-500 nml per min
+ Pressure transmitters for inlet and reactor pressure
+ Digital interface for thermostat, stirrer and MFC (RS232)
+ Gas leak detectors
+ Material: stainless steel 316L

Options

+ Other materials, such as Hastelloy C-22
+ Higher pressure
+ Other flow rates on request
+ Dosing of other gases
+ Liquid dosages
+ Calorimetric measurement
+ EEx design according to the ATEX guidline
+ Fully customised systems

Turnkey solutions

Would you like to outsource the interface risk and the project handling? We will be happy to offer the FlexyCLAVE as part of a turnkey solution.

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FlexySys

The modular Software platform



Preparation of your experiment

- **EductX:** Automated integration of reactant specific data from an ELN (data base).
- **OperX:** Create your recipe wherever from you want.
- **SamX:** Your assistant to switch peripherical devices easily.

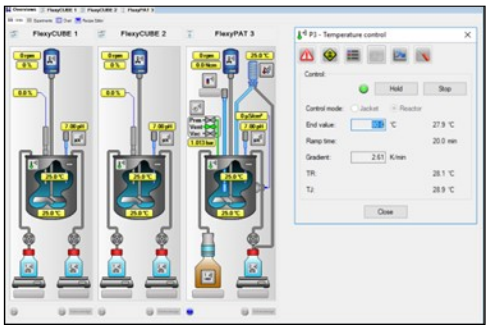
Compliance, comfort and safety

- **SecureX:** Makes your software GMP compliant (CFR 21 part 11).
- **RemoteX:** Control your reactor from wherever you want.
- **MessageX:** Your email alert.

Data Management

- **ChartX:** Graphical view (trend) of your experiment.
- **e-Journal:** Automatic generated lab journal of your experiment.
- **CollectX:** Automatic data transfer to an ELN, LIMS, cloud etc.

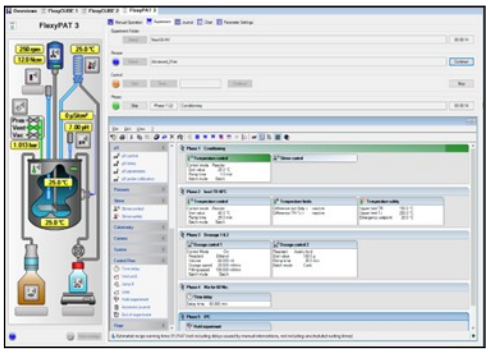
FlexySys - The modular software platform for your laboratory application



FlexySys — simplicity and flexibility through structured functions

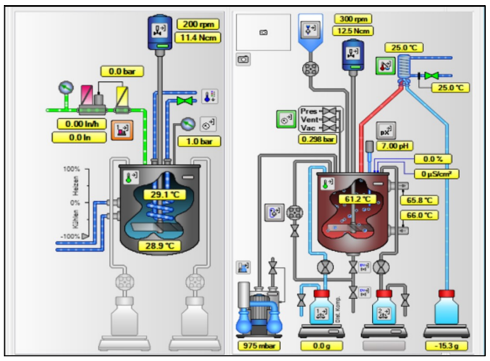
Simplicity: Thanks to intuitive functions, experiments can be carried out safely and without extensive training.

Flexibility: Thanks to a wide range of standardized functions, we can offer you a solution tailored to your own process, so that you can conduct your work as efficiently as possible. Existing equipment can also be integrated into the software. This way, you not only save money, but also increase the system's availability.



Efficiency, safety and reproducibility thanks to recipe control

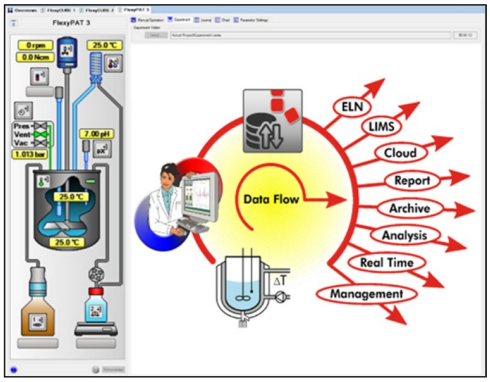
Using recipes, sub-processes such as inerting or even complete experiments can be carried out reproducibly and efficiently, even without supervision. Maximum flexibility is guaranteed by the combination of manual interventions, fully automatic recipe operation and the "edit on the fly" function. Alongside all the necessary safety limits, which the system immediately regulates into the previously defined safety state, a variety of process limits can also be defined. These include, for example, the maximum permissible temperature rise during dosing.



Customer-specific adjustments

The software can be tailored to a large number of different processes. For example, distillations, filtrations or pressure controls can be automated via the software using standardized functions, while reaction energies can be measured (calorimetry) or analysis devices such as turbidity measurements and particle size analyzers can be implemented.

Customer-specific turnkey solutions, combined with services in the field of plant design and plant qualification in the GMP environment (IQ/OQ), protect your investments, thanks to the modular way that they can be adapted.



Data management and eJournal

During an experiment, all the events and data are recorded automatically. This also applies for any integrated analytical instrument. In addition, all the data along the workflow, such as the numbers of manual weighings of solids or the batch numbers of educts, can be managed via the software. All the data and information is compiled in Word format in an automatically generated e-journal, which can then be centrally archived in higher-level data management programs (ELN or LIMS) using the "CollectX" add-on. This way, the traceability of all the experiment related data is ensured and data analysis is also guaranteed across departments.

SYSTAG, System Technik AG

Bahnhofstr 76| 803 Rüschlikon
Telefon +41 44 704 54 54 | Fax +41 44 704 54 55
infos@systag.ch | www.systag.ch

System Technik Deutschland GmbH

Rodheimerstr 63 | D-61191 Rosbach
Telefon +49 6003 93 50 50 | Fax +49 6003 93 50 52
infos@systag-deutschland.de | www.systag.ch