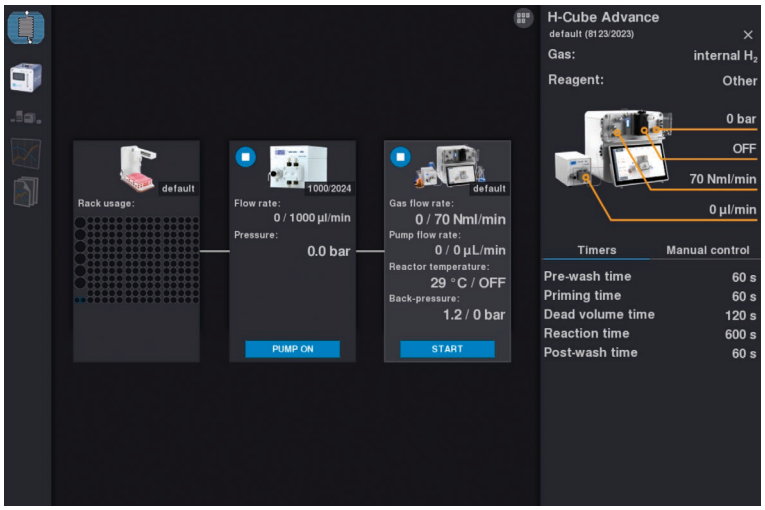
INTRODUCING **INSTRUMENT FLEETS** – A MULTI-PURPOSE FLOW CHEMISTRY PLATFORM FOR SIMULTANEOUS CONTROL OF PARALLEL PROCESSES ON A SINGLE INTERFACE

VISION AND CONCEPT

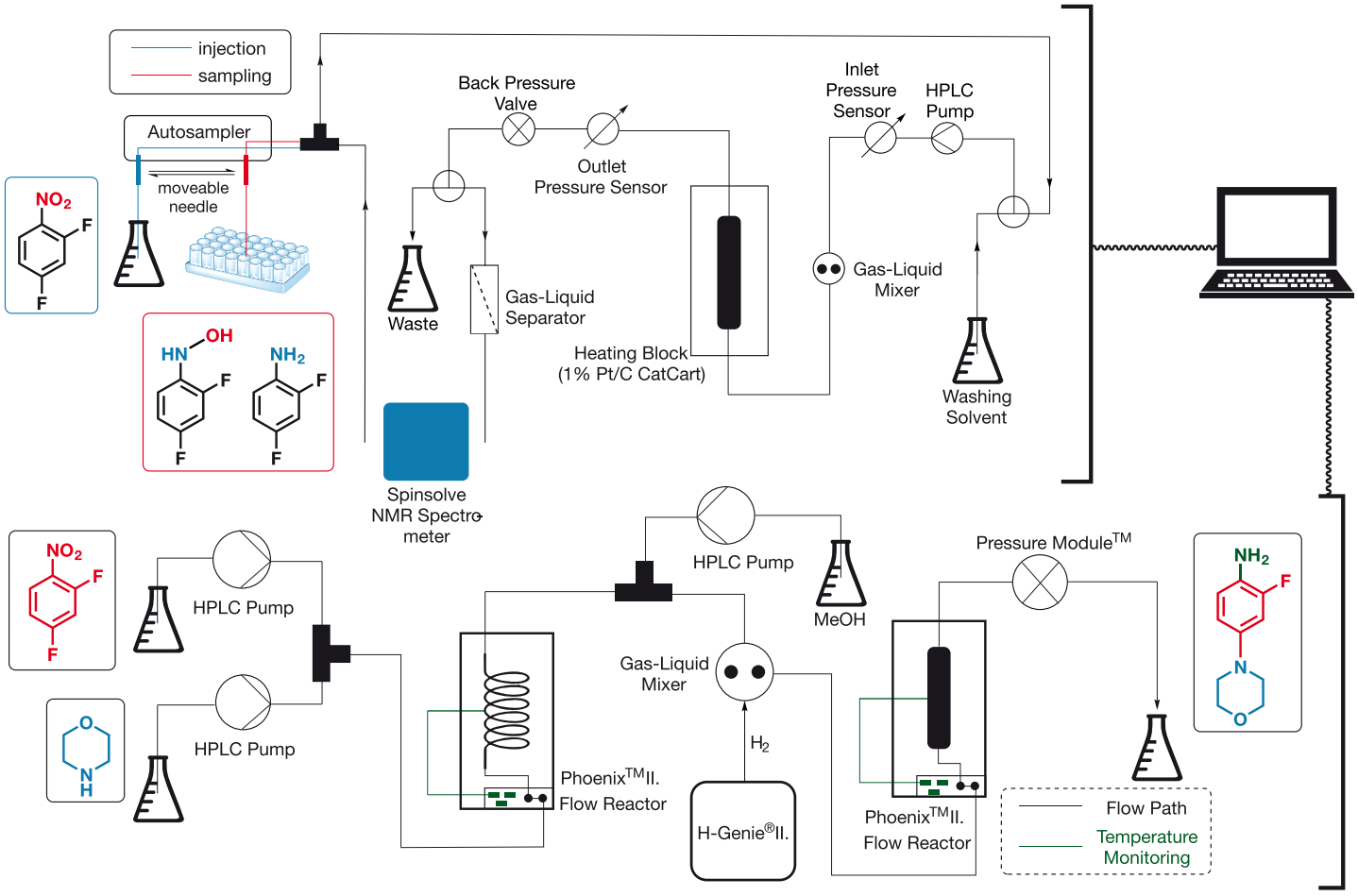
Standalone flow reactors, as well as some more complex flow chemistry systems, consisting of multiple devices, have been known to researchers for a few decades. ThalesNano is now introducing a new dimension of complexity – **instrument fleets**. It can be viewed as an interlinked network of systems, running on a unified controller interface, capable of performing more complex syntheses, or parallel reactions resulting in multiple products simultaneously. Fleets can enhance reaction optimization and large-scale production, facilitate the automation of processes and support in-line real-time analysis.



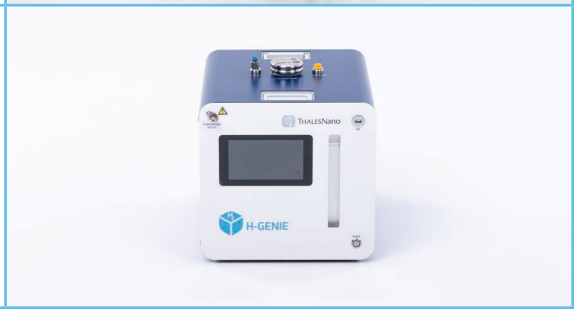
WHY CHOOSE INSTRUMENT FLEETS?

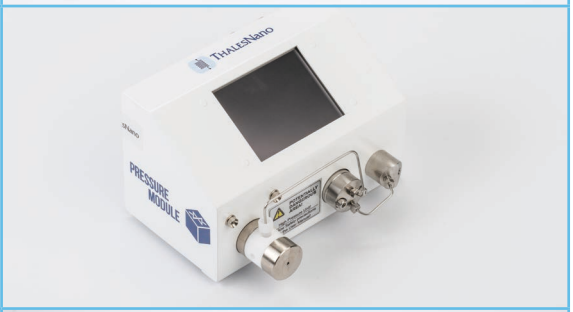
- Opens a possibility to design automated flow chemistry reactor systems or parallel synthetic platforms to perform and control more complex syntheses or multiple experiments simultaneously.
- Allows highly customizable, modular setups.
- Rapid and automatic parameter screening, optimization and library synthesis.
- Reactions are scalable from laboratory scale to kg/day production.
- Allows the integration of third-party instruments and techniques, such as in-line analytics (GC-MS, HPLC-MS, NMR, IR) for immediate information on conversion and structure of products.

EXEMPLARY SETUP – SIMULTANEOUS SMALL-SCALE OPTIMIZATION WITH REACTION MONITORING AND LARGE-SCALE MULTISTEP API-DRIVEN SYNTHESIS



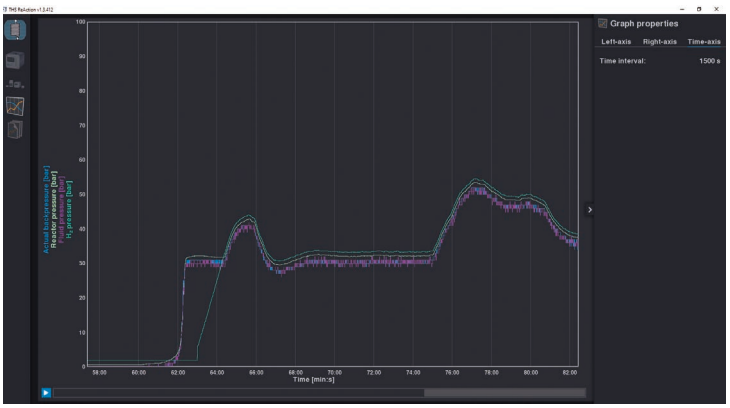
INSTRUMENTS OUR FLEET CAN INCLUDE

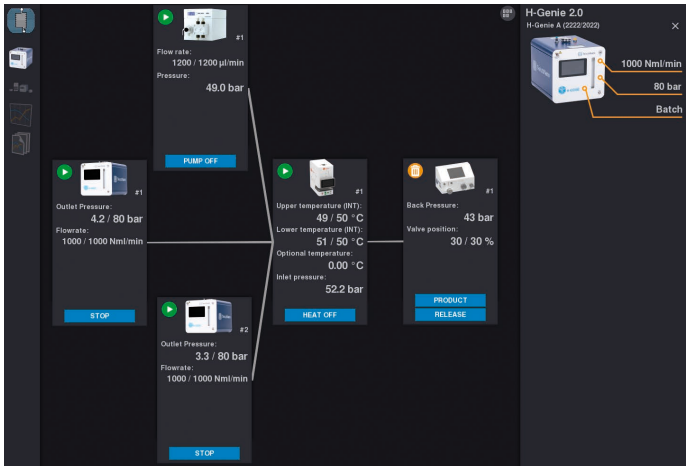
Phoenix™ Flow Reactor: supports coiled loops (4-16 mL) or loaded catalyst columns (1/8" – 1" diameter, 125 mm or 250 mm length, mass of filling can range from 0.1 - 85 grams) for homogeneous or heterogeneous reactions. The reaction zone can be heated to 450°C and it can be used at up to 200 bar pressure.	
H-Genie®: uses water electrolysis to produce 99.99% (4.0) pure hydrogen gas at up to 1 NL/min flow rate and 100 bar pressure. It is a safe alternative to hydrogen cylinders, as it allows the user to avoid the storage of large volumes of H_2 gas. It has an integrated mass flow controller, operated from the touch screen of the instrument, for the accurate dosing of the hydrogen gas.	

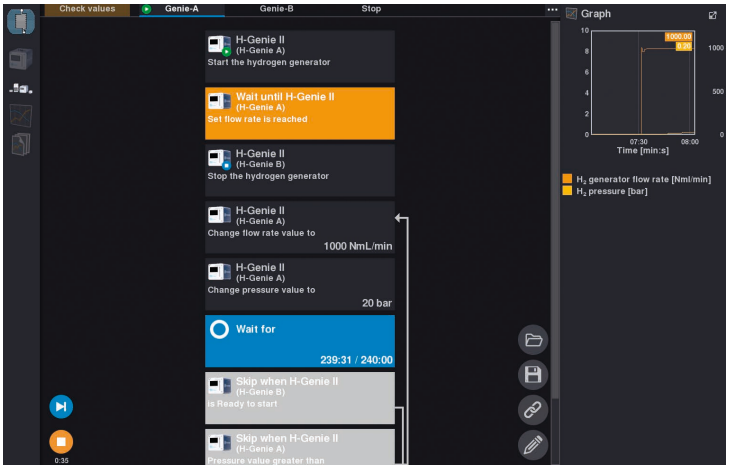
Gas Module Plus: allows the injection of 14 different gases into our systems from an external source at up to 1000 NmL/min flow rate. Its firmware is pre-programmed to accurately dose these gases using its integrated mass flow controller in a safe manner.	
Pressure Module: responsible for building the back pressure inside the reaction zone using an automated valve and pressure sensor. It can be controlled remotely and is equipped with an automated pressure regulation mode, as well as an option for easily switching between waste and product collection.	
System Controller: responsible for creating the communication chain between the fleet members. Monitors and controls all instruments within the fleet, and transfers all data to a computer to allow easy operation of the entire fleet from a single screen.	
H-Cube® Advance: A complete bench-top flow reactor, designed to perform heterogeneous catalytic reactions including hydrogenations. It can be equipped with pre-filled catalyst columns of various sizes. It can produce up to 70 NmL/min hydrogen gas, can heat or cool the reaction zone between 5-150°C, and can operate at up to 100 bar reaction pressure.	
HPLC pumps: responsible for carrying the liquid components of the reactions at flow rates between 0.01 – 50 mL/min. They can also be controlled fully and remotely from the same screen as the other fleet members.	
Brooks AIM3300 Autosampler: automatically injects and collects samples into/from the reactor system using a moveable robotic arm. This instrument can be integrated into our controller system to allow an automated reaction parameter screening and rapid optimization.	

FEATURES

- Real-time monitoring and logging of all reaction parameters – follow and control all of your experiments on one screen!
- Graph function to visualize experimental details
- User-definable operation steps and customizable safety features for enhanced fleet control
- Option for automated reaction sequence programming







POSSIBLE REACTION TYPES

- Single- or multi-component liquid phase reactions
- Biphasic gas-liquid reactions with homogeneous catalysis
- Liquid phase reactions with heterogeneous catalysis, including cross-couplings
- Triphasic gas-liquid-solid reactions with heterogeneous catalysis, including hydrogenations
- Highly endothermic and thermally induced reactions, rearrangements

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www.thalesnano.com
linkedin.com/company/thalesnano-inc-/
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facebook.com/ThalesNano/

ThalesNano Inc.
Záhony utca 7. | H-1031 Budapest | Hungary
Phone: +36 1 880 8500
Fax: +36 1 880 8501
Email: sales@thalesnano.com
www.thalesnano.com

US Office
50 S. Penn St. Suite B-2
Hatboro PA. 19040
USA
Phone: 215-534-3365
E-mail: USAsales@thalesnano.com