



MILESTONE
H E L P I N G
C H E M I S T S



MicroSYNTH
Microwave Synthesis Labstation

The benefits of microwave-enhanced synthesis

Microwave enhanced chemistry represents a fundamental step forward in the capabilities of synthetic chemists. Since its introduction, it has allowed to run experiments faster than ever before and with higher yields, and to scale-up reactions reliably from milligrams to much larger quantities, without the need of reaction optimization. Today, microwave assisted synthesis has become a cutting-edge technology across the pharmaceutical, biotech, polymers, fine-and agro-chemical industries, with thousands of units installed worldwide.



The MicroSYNTH benefits

- » Enhanced microwave field homogeneity
- » Advanced reaction control
- » High safety
- » Unmatched application versatility
 - Large batch
 - Reaction optimization
 - Parallel scale-up capability

Introducing the new Milestone MicroSYNTH

Milestone's state-of-the-art MicroSYNTH is the most innovative microwave synthesis platform available on the market.

The MicroSYNTH offers unmatched flexibility of operation; it allows operations in both open and closed vessels, and chemical reactions can be optimized in small volumes and then taken to larger scale within the same microwave unit.

The MicroSYNTH offers such excellent scalability because of its multimode design and its inherent safety.

Field homogeneity

The microwave field is homogeneously diffused throughout the entire cavity by a specifically designed mode stirrer.

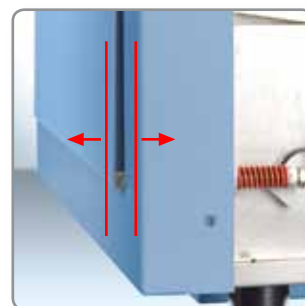
As a result, chemists can achieve uniform results in a wide range of vessels, and can process multiple reactions simultaneously or explore large reaction volumes. Precise reaction monitoring and control, with an intuitive, easy-to-use software interface, provides exact reproducibility and complete documentation.



Unique pressure responsive door

The MicroSYNTH's door features an innovative opening and self resealing mechanism. The door is mounted on spring-loaded steel bars and, in case of a sudden over-pressurization of the cavity, it opens slightly for immediate and safe release of the overpressure.

Microwave power is instantaneously cut-off. Immediately afterward, the door is pulled back by the springs resealing the cavity.



SafeVIEW

The MicroSYNTH is equipped with the SafeVIEW, a high definition digital camera combined with a 5,6" TFT-LCD module. The SafeVIEW allows the chemist to visually monitor the course of the reaction although fully protected by the all-stainless steel door of the instrument.

Additionally, a video of the entire microwave run can be recorded and saved as MPEG file on a Windows-compatible memory card.



Software-controlled magnetic stirrer

A magnetic stirrer is built-in in the MicroSYNTH system. It is designed to ensure vigorous stirring of the solutions in all vessels, independently on their position in the cavity, thus assuring reliable and consistent results.



MicroSYNTH features

Advanced reaction control

The MicroSYNTH is operated via a compact terminal with bright, full-color, touch-screen display.

The terminal runs the Milestone's unique EasyCONTROL software, to provide an easy, user friendly control of the microwave process.

Simply recall a stored procedure or create a new one, press 'START', and the system will follow the drawn temperature profile, or just apply the set microwave power for the desired time. The MicroSYNTH terminal saves methods and runs on a flash memory card or on a pen drive memory, readable by any external computer.

Furthermore, with the Milestone EasyDOC software, all data can be graphically displayed and converted into a standard format readable by any database or spreadsheet software.

The MicroSYNTH is equipped with the most advanced sensors for accurate control of all reaction parameters (microwave power, time, temperature, pressure, and stirring speed).



TempSURE temperature control in all vessels

The TempSURE results from a combination of fiber optic, infrared, and a unique microprocessor controlled rotor positioning system.

This enables the software to identify which vessel is passing in front of the infrared sensor while the rotor is turning. The software correlates the internal and the external temperatures with the ID code of the vessel.

The TempSURE allows for a full documentation of the temperature in all vessels, thus facilitating the reaction scale-up.



Reaction optimization *SV and BSV setup*

The single vessel SV and BSV setup provide vessels for the full optimization of a reaction for research or teaching purposes.

This package includes a 45 mL quartz vessel which allows to perform reactions at temperature up to 250°C and pressure up to 40 bar.

The vessel is hosted in a safety shield which features a built-in pressure control through a preloaded spring with vent-and-reseal mechanism.

A special PTFE cover is equipped with ports for direct temperature and pressure control.

An optional cover permits to flush the reactor with inert gas, or to pre-load a gaseous reactant for gas-liquid reactions.

Rapid cooling is ensured by a stream of compressed air.

The SV package also includes a PTFE reaction vessel with a PEEK shield, suitable for all the applications where improved chemical resistance is required, or higher pressures (up to 100 bar) are expected.

Large batch reactions *NP setup*

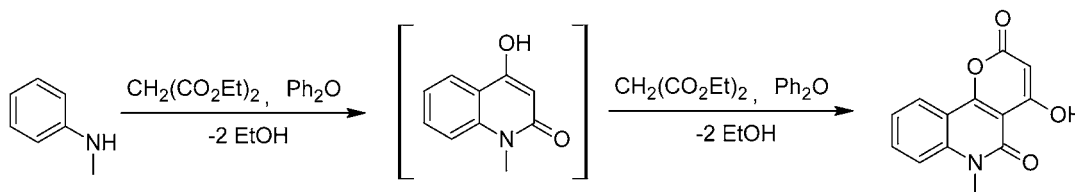
The normal pressure NP reactors allow chemists to perform synthetic reactions under reflux.

Ordinary laboratory glassware can also be used in the MicroSYNTH.

In this way, any chemical reaction currently performed with a hot plate, heating mantle or oil bath, can be immediately transferred to the microwave.

This will permit the chemist to investigate the effects of microwaves on reaction rates and mechanism.

Microwave preparation of 4-hydroxy-6-methyl-2H-pyrano[3,2-c]quinoline-2,5(6H)-dione using fractional product distillation.



T. Razzaq, C.O. Kappe, *Tetrahedron Letters*, 48, **2007**, 2513.

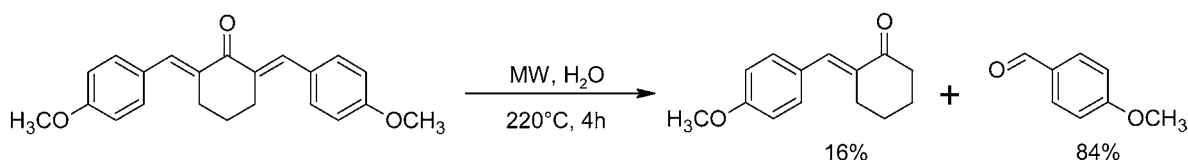
Parallel format scale-up *QK and SK setup*

The Q-20 rotor uses up to 20 quartz vessels QV-50 and offers elevated throughput, very fast heating and cooling, and easy handling.

A fully automated capping system is also available from Milestone to enhance the automation of the synthetic process.

When scaling up a reaction under conditions of extremely high temperature and pressure, there is no better choice than the HPR rotor; this rotor accommodates up to 10 SK-10 reactors, each of which can be individually inserted in the MicroSYNTH microwave cavity.

Hydrolytic cleavage of (2E,6E)-2,6-bis[(4-methoxyphenyl)methylidene]cyclohexan-1-one in high temperature water.



X.J. Bi, L.T. Higham, J.L. Scott, C.R. Strauss, *Australian Journal of Chemistry*, 59, **2006**, 883.

Microwave hardware

- Dual magnetron system with pyramid-shaped diffuser for homogeneous microwave distribution in the cavity.
- Magnetron protected from reflected microwave power.
- Installed microwave power of 1600 watt.
- Output microwave power of 1500 watt, controlled via microprocessor.
- Patented self-sealing pressure responsive stainless steel door.
- Door with glass window.
- Automatic door locking system.
- Built-in video camera for on-line inspection of vessels, rotor and sensors for maximum safety of operation during run.
- PTFE protection for video camera against all type of acids/solvents.
- Built-in color display 5.6" with backlight LED for internal video camera.
- Large microwave cavity of 35 x 35 x 35 cm (43 liters).
- Cavity illumination.
- Microwave cavity entirely made of 18/8 stainless steel housing with multi-layer PTFE plasma coating applied at 350°C.
- All hardware protected against acids and solvents with polymer coating both on inside and outside surfaces.
- Total of 7 micro-switches of which 4 safety interlocks to prevent microwave emission with door open.
- Exhaust located above the cavity, separate from electronics to prevent corrosion.
- Weight: 90 kg; external dimensions: 55 x 55 x 65 cm.
- Electrical supply voltage: 230V/50-60Hz; power consumption: 3.5 kW.

Reaction sensors

- Direct temperature monitor and control via fiber optic up to 300°C in a reference vessel.
- Contact-less temperature monitor and control via infrared up to 300°C in all vessels.
- Direct pressure monitor and control via pressure transducer up to 100 bar in a reference vessel.
- Contact-less pressure monitor and control up to the vessels highest working pressure.

Control terminal

- 6.5" Touch-screen industrial grade controller.
- VGA resolution 640 x 480 for sharp process graphic.
- 1 USB port for printer, 2 PS2 ports for mouse and keyboard, 3 RJ 45 ports for external devices.
- Methods and runs saved on PC-compatible removable flash-card and USB pen-drive.

Specifications are subject to change without notice.

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