LABOTRON ES 3 and 6 kW
EXTRACTION and SYNTHESIS

Labotron ES is a new generation of high-performance chemical engineering equipment for batch or continuous-flow microwave synthesis and extraction.

Labotron ES incorporates the INTLI (internal transmission line) technology patented by[1] SAIREM as well as the latest innovations to adapt any reactor geometry on a special waveguide. It allows you to control all the parameters of a process that becomes perfectly reproducible and industrially scalable.

Labotron ES offers, safely, the development and realization of chemical processes with a minimal footprint and with reduced costs compared to traditional microwave-assisted systems. A centralized steering system allows for very precise control of the process.

The principle of this microwave-assisted system is to bring, very selectively, a large amount of energy **directly** inside the reaction mix. Given the high precision of the generators used, Labotron makes it possible to carry out a wide range of chemical processes efficiently and repeatably, from a few grams to several kilograms per hour. INTLI technology brings new perspectives to microwave chemistry and in particular the possibility of extrapolating results to an industrial scale, continuously or in a recirculation system.

MAIN APPLICATIONS

- Extraction
- Chemical synthesis

[1] Patents WO2009/122101 and WO2009/122102

KEY BENEFITS

TECHNOLOGY

- Permanent control of pressure and temperature inside the reactor
- Precise microwave power management to track desired thermal cycle
- Automatic impedance matching for minimum levels of reflected power
- Rapid changeover between several types of reactor, on the same microwave head, for more flexibility
- Batch reactor: efficient mechanical stirring with adjustable speed
- Adding reagents, sampling or product removal online during the process
- Optimized geometry of INTLI technology to achieve high microwave power density
- External cooling envelope around the reactor to keep the reaction medium at very low temperature
- Real time reading of the values of incident and reflected power to determine the energy absorbed by the treated sample and thus allow the process to be optimized

ERGONOMICS

- Mobile platform for quick installation and positioning
- Programmable logic control and touchscreen operator interface. All indicators and states, including recipe changes, alarms and chemical levels, are accessible from the touch screen
- Quick connectors for increased flexibility and faster cleaning and maintenance process.

SAFETY

Integrated software system (Reactor Active Recognition Control) prevents the operator setting dangerous power/reactor type combinations.

Various safety equipment and interlocks that automatically monitor and control the process, always providing safe and reliable operation: continuous control of microwave power, pressure and temperature sensors, product load detection by reflected power level, detection of microwave leaks.

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REACTORS

The Labotron is available with 2 microwave generators of choice at 3 kW and 6 kW with different microwave-assisted reactors in batch or continuous-flow. The technological choice depends on the type of process, the recipes and operator's needs, considering the availability, costs and chemical performance. Two types of reactors are available with LABOTRON :

BATCH REACTOR

Offering volumes of 1.5 L, 4 L and 20 L. Inside, the INTLI is placed in the middle of the reactor in direct contact with the reaction mixture. The reactor is made of high-quality stainless steel and is equipped with an external cooling envelope and an internal mechanical stirring system. The reactor and INTLI can be fully coated with PTFE or Hastelloy to allow the safe use of solvents or acids.

Swagelock 1/4" and flow meter fittings are available for the use of gas (nitrogen, air etc.), connection to a condensation/distillation column, a maximum of 4 thermometers (optical fiber or thermocouple), a port for adding reagents during the reaction (without the need to stop microwaves) and online sampling, etc.

The cooling of the reactor can be controlled and programmed so that it starts only if necessary. The control of this function is managed by the temperature of the reaction.

CONTINUOUS-FLOW REACTOR

This system has a proven track record of improving the performance, selectivity and safety of liquid-liquid and liquid-steam reactions. Temperature measurement and control are available via a thermocouple installed at the exit of the reactor.

Labotron offers great flexibility: all reactors are easily interchangeable and connections are made via standard fast connectors. The same system can be easily configured to run a large number of applications including solvent extraction, chemical synthesis, hydrolysis ... on a laboratory scale or on an industrial scale.

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SPECIFICATION KEYS

Reference	LABOTRON ES3000	LABOTRON ES6000
Microwave power max	3 kW continuous wave (CW) or pulsed, adjustable from 0 W to 3000 W	6 kW continuous wave (CW) or pulsed, adjustable from 600 W to 6000 W
Frequency	• 2450 MHz ± 25 MHz	
Microwave adaptation	• Self-adaptor	
Control	• Incidental power, reflected power and temperature via full display on 12'' color touchscreen • Data recording: RJ45 and USB data logging ports	
Security	• Automatic recognition of the connected reactor type • Safety valve at 1.5 bar • Isolator for the protection of the magnetron from reflected energy and to ensure constant supplied power • Touch screen protected from chemical splashes • Light column signaling (red, yellow, green) and audible alarm • Fixed microwave leak detector • Electrical cabinet protected by anti-corrosion paint	
Measuring and controlling temperature	• Optical fiber (from -80 to 250 ^{0}C) • Thermocouple type K, Inconel, up to 950 ^{0}C	
Batch Reactor	• Volume 1.5 to 20 L; to be specified when ordering • Material: stainless steel or other optional materials • Cooling: Water • Working pressure: max. 1.5 bar • Stirring: mechanical with adjustable speed	
INTLI	• Aluminium or aluminum protected anticorrosion	
Voltage	• 1 phase 240 V 50/60 Hz	• 3 phases 400 V, 208 V, 50/60 Hz
Cooling the microwave generator	• Water, min. 4 L/min, • With integrated control valve T_{water} - 18 - 25 ^{0}C, ambient $T_{ambient}$ - max. 40 ^{0}C	• Water, min 6 L/min
Dimensions (H x P x l) mm[2]	• 1560 x 661 x 1100 (with U-shaped guide and plugged-in reactor)	• 1600 x 900 x 1100 (with U-shaped guide and plugged-in reactor)

[2] The full opening of each side panel requires 650 mm.

MAIN DIMENSIONS