



**Anton Paar**

## Synthos 3000

Enhanced Microwave-Assisted Synthesis

::: Big Deal in Organic Synthesis



# Synthos 3000

## Scale-up Instrument

### Scaling up protocols

After a decade of applying microwave irradiation to accelerate and improve organic synthesis protocols, it is now time to enable the large-scale production of desired compounds using microwave technology.

The Synthos 3000 ensures direct scalability and facilitates the application of your optimized protocols for large-scale synthesis.

### The idea of scale-up

The new Synthos 3000 has been developed to enhance the performance of microwave-assisted organic synthesis. It is a microwave platform dedicated to the multigram synthesis of products within one run. The highly homogeneous field guarantees direct scalability when applying your optimized synthesis protocols from small-scale method developments.

No need to change the parameters, just multiply the amounts of reagents to achieve large batches of your desired targets. The different vessel and rotor types enable you to obtain the best solution for your individual experimental tasks. Thus, the Synthos 3000 is not only a production tool, but also suitable for investigating new methods in organic synthesis.

# High Performance Organic Synthesis

### Flexible and outstanding

Besides upscaling standard experiments, the Synthos 3000 can be used as a tool for special applications which are hardly accessible with conventional instrumentation: from smooth, low-energy heating ramps up to extreme high-pressure and high-temperature conditions. Different rotor types, several kinds of vessels and various sophisticated accessories make the Synthos 3000 a powerful platform in the synthetic laboratory. A unique cooling system reduces overall process times and provides excellent, reproducible results.

### Scale up & parallel synthesis

Two different rotor types for up to 1L volume or 16 different samples at one time, suitable for any kind of chemistry.

### Solid-phase chemistry

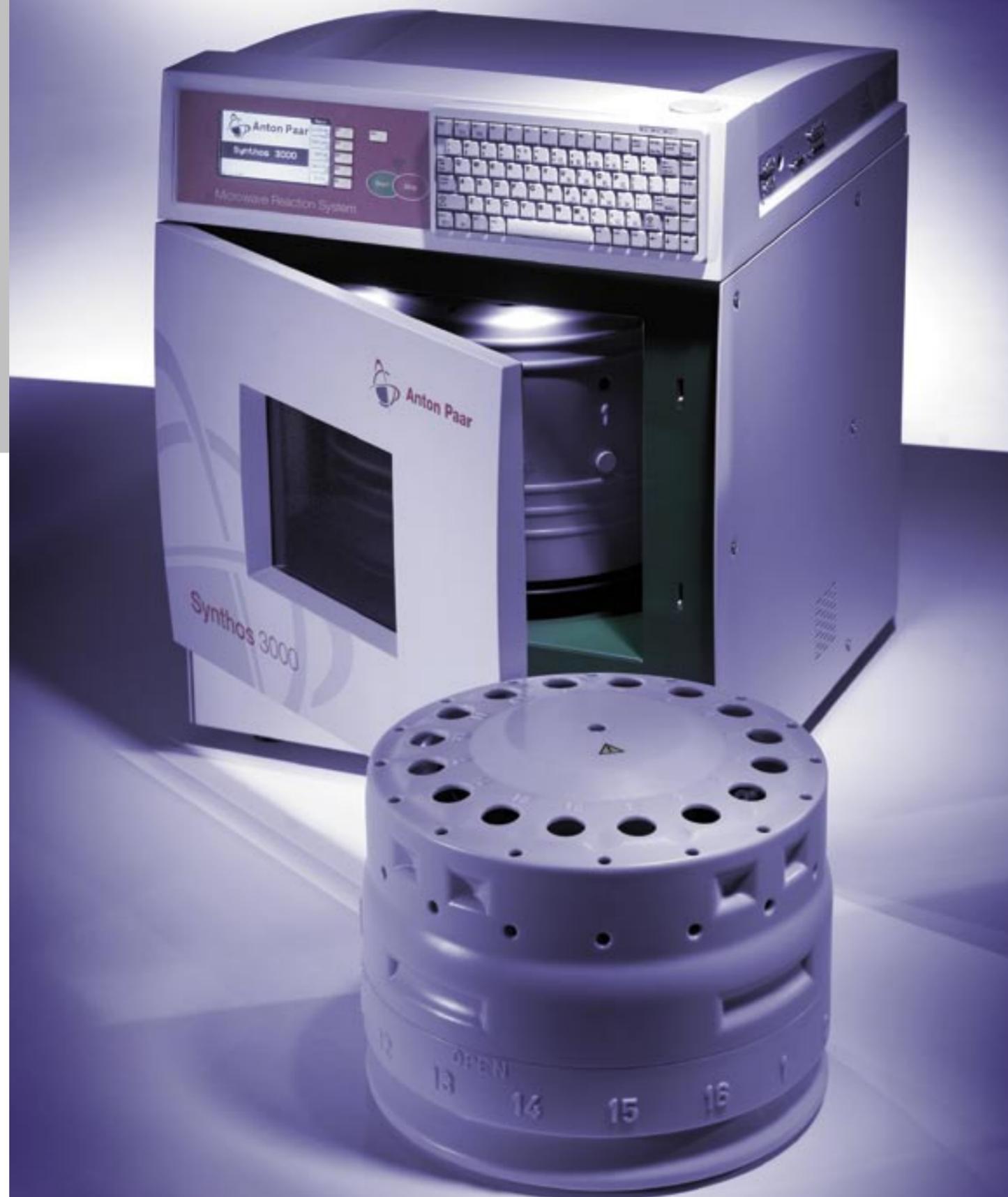
Easy handling of polymer-supported reagents in high-quality PTFE liners. No vessel changing for washing/cleavage steps utilizing the sophisticated filtration kit.

### Gas loading

Creation of an individual inert or reactant gas atmosphere with up to 20 bar in every single vessel.

### High-pressure reactions

Featuring the highest temperature/pressure conditions on the market, simplifying access to near-critical water chemistry.



# Synthos 3000

## Rising High

- ▶ 1400 W unpulsed microwave power output – for fast and reproducible reactions
- ▶ Two magnetrons with optimized waveguides – for uniform heating and long service life
- ▶ Reliable temperature and pressure sensors – for optimum reaction control and safety
- ▶ Remote sensor technology – unmatched ease and speed of handling, no installation required
- ▶ Powerful cooling unit – for minimized process time and suppression of side-reactions



## Features & Benefits

- ▶ Programmable magnetic stirrer – for enhanced reaction rates and improved yields
- ▶ Sophisticated accessories – for advanced experimentation in synthesis, work-up and purification
- ▶ Intuitive software – for easy control and documentation of reaction protocols
- ▶ Multiple safety system – for efficient user protection in case of unforeseen reactions
- ▶ Industrial-quality components – for long, reliable operation, even under harsh conditions

### Built-in forced-air cooling system

A unique, patented air gap design provides effective heat transfer, improving the economic value of the whole process by fast cooling. No external cooling devices are required, solvent vapors are exhausted efficiently.

### Dual temperature sensor design

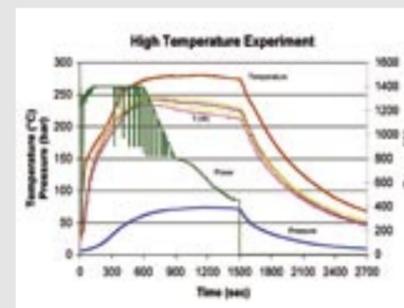
Precise temperature control is the most critical point in organic synthesis. Synthos 3000 offers a dual solution: an IR sensor underneath the cavity sensing each vessel and an accurate immersing temperature probe in one reference vessel.

- ▶ Remote sensing – no installation, no disturbing wires!
- ▶ Gas bulb thermosensor - no microwave interference

### PTFE-coated cavity

Durable, industrial-quality components make the Synthos 3000 suitable for harsh experimental conditions. Its 66 liter stainless steel cavity is efficiently protected by a multi-layer PTFE coating.

- ▶ Maximum corrosion resistance
- ▶ Easy cleaning and maintenance
- ▶ Prepared for future system expansions



### Safety system with resealing door

User safety in case of unforeseen spontaneous reactions is one of the major concerns in chemistry at extreme conditions, especially on a larger scale. The Synthos 3000 has sophisticated sensors for reaction control and numerous additional active and passive safety measures.

- ▶ Multiple overpressure release devices
- ▶ Protection shields
- ▶ Impact resistant safety door with interlocks which automatically reseals the cavity after a pressure release

### Reasonably priced software solutions

It is simple to operate the Synthos 3000 multi-tasking software using the spill-proof keypad and the external keyboard. The bright graphic display shows pressure/temperature curves of reactions and other process parameters which are controlled online with software safeguards. Documentation is available at the push of a button. Simply connect a compatible printer or transfer reaction data to an external host PC.

### Built-in magnetic stirrer

Sufficient admixing of reaction mixtures is essential in organic synthesis. Synthos 3000 provides a powerful stirrer to enable perfect mixing in every vessel for

- ▶ Higher conversion rates
- ▶ Improved yields
- ▶ Shorter reaction times

## The Vessels

### High Performance Modularity

The Synthos 3000 system offers various vessels and rotors with exceptional modularity and interchangeability. Its flexibility allows you to apply optimized systems for a wide variety of organic reactions in solution and on solid phase.

All Synthos 3000 vessels have unique, patented features: self-sealing lip-type seals, air cooling and remote sensing systems. For use with Rotor 8, high purity quartz glass and microwave-transparent ceramics give excellent temperature and pressure resistance. Compound designs with precisely tooled PTFE-TFM liners for Rotor 16 show unmatched dimensional stability and service life.



## The Rotors

### Satisfying Any Demand

#### Features & benefits

- ▶ Easy hand tightening of vessels and rotors for quick and simple setup
- ▶ Hermetic sealing prevents loss of volatile compounds
- ▶ Installation-free sensor technology
- ▶ Wireless transmission of measured parameters
- ▶ Short cool-down times ensure high sample throughput
- ▶ Pressure release prior to rotor opening minimizes operator exposure to hazardous reaction gases
- ▶ High overpressure tolerance provides trouble-free operation even at extreme conditions
- ▶ Unique hydraulic pressure system for simultaneous pressure sensing in all vessels of Rotor 8

#### Special applications

As quartz glass provides the best temperature stability, it is best suited for high temperature and high-pressure applications, up to 80 bar at 300 °C, suitable even for reactions in near-critical water.

The sophisticated Gas Loading System enables you to create a reactive or inert gas atmosphere individually in each vessel. Pressures up to 20 bar can be applied prior to reaction to carry out syntheses with sensitive compounds safely and effectively.

Polystyrene resins do not adhere to PTFE, thus making these vessels highly suitable for solid-phase synthesis. Applying different pressure jackets allows these liners to withstand pressures up to 60 bar, ensuring not only synthesis on but also cleavage from polystyrene resins under microwave conditions. In combination with the filter unit you can use the Synthos 3000 for a complete sequence of solid-phase organic synthesis without changing the vessels, thus minimizing the loss of compounds.



Rotors	16MF100	16HF100	8SXF100	8SXQ80
No. of vessels	16	16	8	8
Reaction control	One reference vessel with accurate immersing temperature probe and pressure sensor plus remote IR temperature control in all positions		Simultaneous pressure control and remote IR temperature control in all positions, plus immersing temperature probe in one reference vessel	
Vessels	MF100	HF100	XF100	XQ80
Liner material	PTFE-TFM	PTFE-TFM	PTFE-TFM	Quartz
Pressure jacket	PEEK	Ceramic	Ceramic	None
Volume	100 mL	100 mL	100 mL	80 mL
Controlled pressure	20 bar (290 psi)	40 bar (580 psi)	60 bar (870 psi)	80 bar (1160 psi)
Max. pressure	70 bar (1000 psi)	70 bar (1000 psi)	120 bar (1740 psi)	120 bar (1740 psi)
Test pressure	140 bar (2000 psi)	140 bar (2000 psi)	140 bar (2000 psi)	140 bar (2000 psi)
Max. temperature	200 °C	240 °C	260 °C	300 °C
Typical applications	Standard scale-up synthesis under moderate conditions, parallel reactions, library generation, solid-phase synthesis		Solid-phase synthesis	Metal catalysis, near-critical water chemistry
			Synthesis under high-pressure conditions, prepressurized reactions, "Green Chemistry" approach	



Fotos: Croce & Wir



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### Instruments for:

Density and  
concentration measurement

Rheometry and viscometry

Sample preparation

Colloid science

Microhardness testing

X-ray structure analysis

CO<sub>2</sub> measurement

High-precision temperature  
measurement

Specifications  
subject to change  
without notice

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