



UltraWAVE

The Game Changer in Microwave Digestion



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CHEMISTS

The UltraWAVE technology

Milestone's unique Single Reaction Chamber (SRC) technology overcomes the limitations of all conventional microwave sample preparation systems.

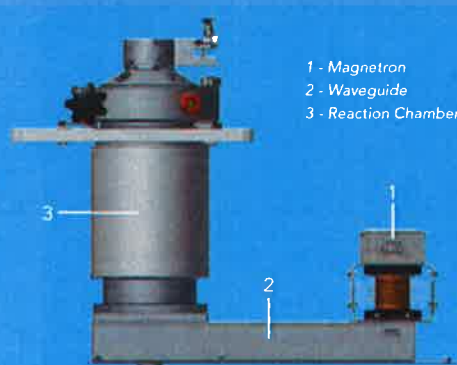
At the heart of the UltraWAVE is a Teflon-lined 1 liter stainless steel reaction chamber, which serves both as a microwave cavity and a reaction vessel.

Samples are weighed into vials, and suitable reagents are added.

Vials are placed in a rack, which is automatically lowered into the reaction chamber.

The chamber is sealed and pre-pressurized with inert gas, which physically acts as a cap for the vials, avoiding boiling of the solutions and preventing cross contamination.

At the completion of the microwave run, a built-in cooling device rapidly lowers the temperature.



UltraWAVE Schematic



1
Sample rack is lowered automatically into microwave chamber



2
Chamber clamp is secured by the operator



3
Chamber is pre-pressurized with inert gas to prevent sample boiling



4
Microwave energy is applied. All samples under same temperature and pressure



5
Very fast cooling step due to water cooling of chamber



6
Clamp is released and sample rack automatically rises from chamber

Digestion vials

Available rack configurations include 4, 5, 15 and 22-position.

Vials are available in Teflon, quartz or disposable glass, and are fitted with Teflon caps- loose fitting to ensure pressure equalization.

Numbered rack trays give the user an easy visual check of vial number.

Unlike conventional microwave digestion systems, no vessel assembly or disassembly is required and, with disposable glass vials, no cleaning step is needed.

This greatly enhances ease of use and increases your sample turn around time.



The UltraWAVE can accommodate inexpensive glass disposable vials

The UltraWAVE vials do not require any capping tool. A reusable Teflon cap is placed on top of the vial in a fraction of a second.

The UltraWAVE can accommodate inexpensive disposable vials.

No need for vials cleaning at all.



The UltraWAVE performance

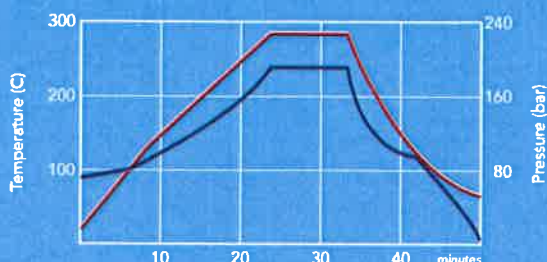
The UltraWAVE is an ultra high performance system, operating up to 199 bar pressure and 300 C.

This allows the complete digestion of extremely difficult samples and of large amounts of organics.

There is no need for a continuous vessel venting, possibly leading to losses of volatiles, to compensate the elevated pressure generated by the sample decomposition, as occurring with low pressure/low volume microwave devices.

And unlike all conventional microwave digestion systems, every sample is under direct temperature and pressure and temperature control- no needs to rely on a reference vessel or to an indirect control such as infrared temperature sensors. This assures complete control of the digestion process in every sample.

The UltraWAVE reaches high temperatures faster, cools faster, and is capable of higher pressure and temperature than any closed vessel system.



Typical UltraWAVE temperature and pressure profile

Safety

Like all Milestone products, the UltraWAVE has been designed with operator safety of paramount importance.

A thick acrylic shield surrounds the work area, which lowers into position automatically as the chamber is closed.

A run cannot be started unless the chamber clamp is in position, and the clamp cannot be released until the chamber is cool, and pressure has been released.

The PID controller monitors pressure, digestion and chamber temperature 20 times/sec, adjusting microwave power instantaneously to control even highly exothermic reactions.

Fast cooling

At the completion of the microwave run, the UltraWAVE built-in cooling device enables the temperature to lower from 270 C to 80 C in just 12 minutes.

Incredible, but true.

Low operating costs

Compared to closed vessel digestion, labor costs are significantly lower because no vessel assembly/disassembly is required, vessel cleaning is eliminated with disposable glass vials, and method development is virtually eliminated.

There are also major savings on consumables costs, which is important for high throughput labs using closed vessel digestion.

The UltraWAVE user interface

The UltraWAVE is operated via a compact control terminal with easy-to-read, bright, full-color, touch-screen display.

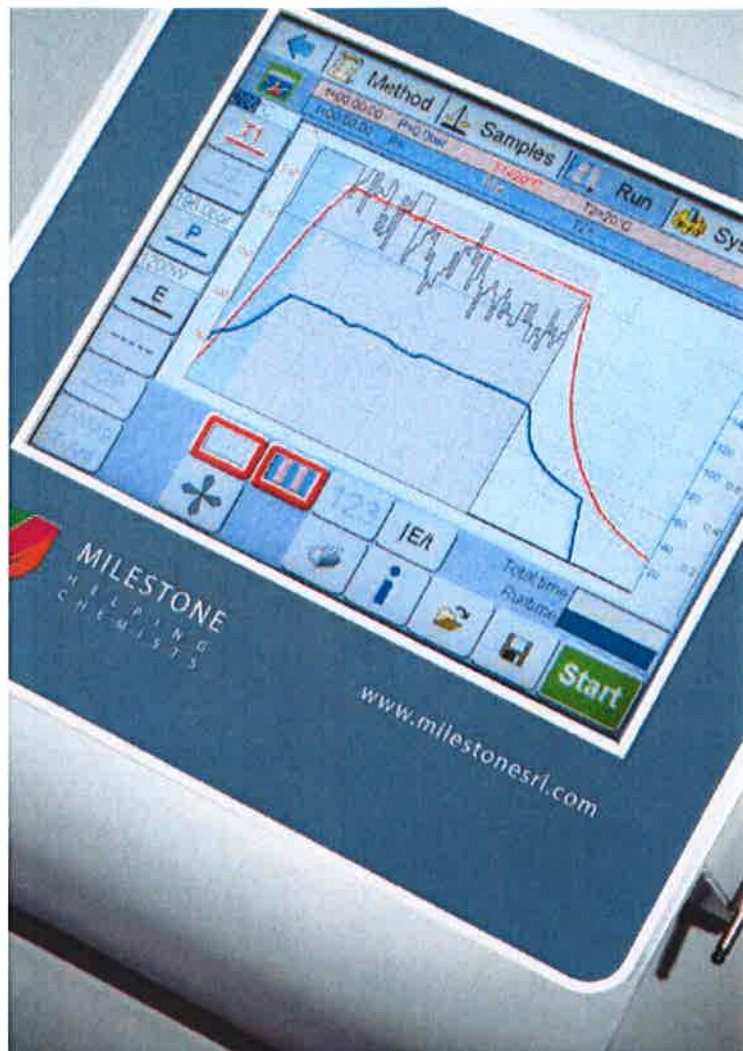
The terminal is provided with multiple USB and RS-232 ports for direct printout of microwave methods and runs, and for interfacing the instrument to external peripherals.

The terminal runs the Milestone's unique multi-language EasyCONTROL software, to provide simple, user-friendly control of the microwave sample preparation process. Simply recall a factory-stored method or create a new one; press 'START' and the system will automatically follow the user defined temperature or pressure profile, utilizing a sophisticated PID algorithm to regulate the microwave power.

Hundreds of applications, including all US EPA methods, are preloaded in the UltraWAVE terminal.

Methods and runs are saved on a USB pen-drive, readable by any PC.

This offers a virtually unlimited memory for storing all your sample preparation data.



One digestion method for all samples



The UltraWAVE is capable of processing in a single run different unknown samples along with certified reference materials and analytical blanks.

With the Milestone UltraWAVE, any combination of sample types can be digested simultaneously; no need to batch samples into identical types. No method development is needed, as the same method can be used for almost every sample type, and no need to use different rotors for different sample types. And for the first time, blanks and reference standards of any matrix can be digested alongside samples, enabling true in-run digestion quality control.



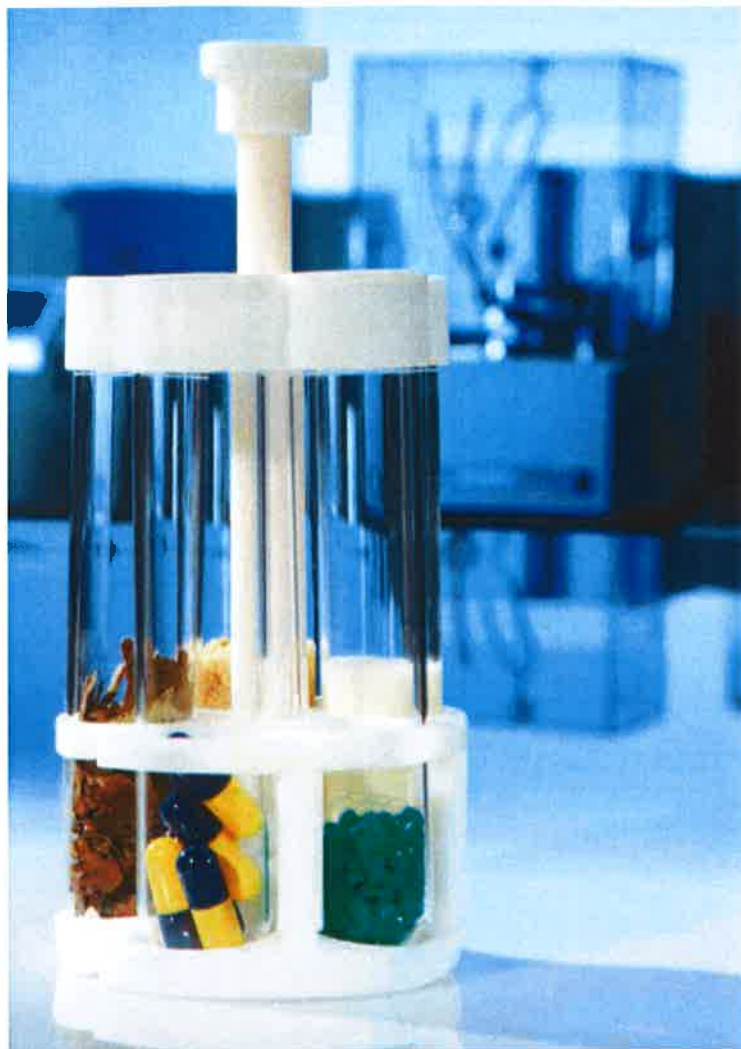
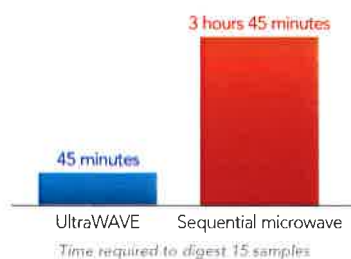
Conventional microwave digestion systems require similar samples to be treated simultaneously.

Larger sample amount

The UltraWAVE vessel has a volume of 1 liter. This is far bigger than any other microwave digestion system, where the typical vessels volume is of 25-100 mL. As a result -along with an allowable pressure of 200 bar- the UltraWAVE is capable of digesting a total amount of organic sample by far greater than any other device. A total of 20 grams -dry weight- organics can be digested in a single run. This means, for instance, 4 grams per sample when using the 5-place rack.

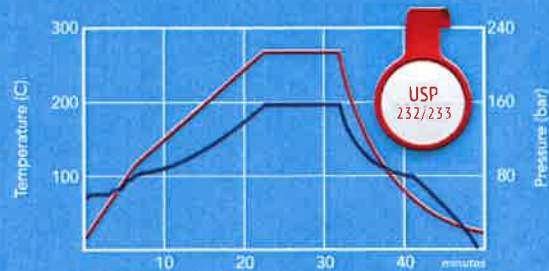
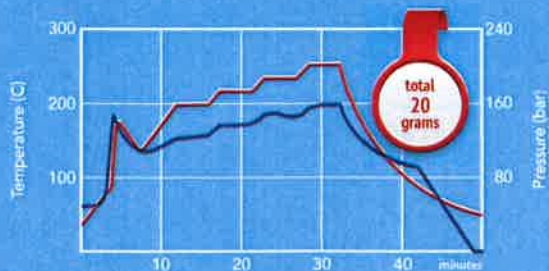
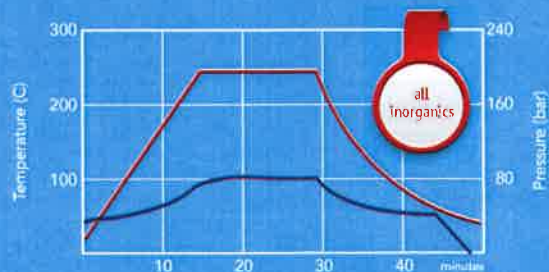
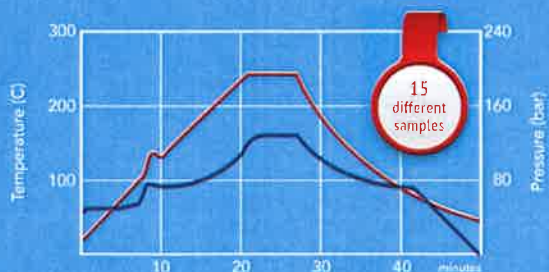
High sample throughput

Compared to all conventional microwave digestion systems, the UltraWAVE is significantly easier to use and workflow is dramatically improved. 15 samples are processed in 45 minutes start to finish. Furthermore, the UltraWAVE sample throughput is far better than with sequential microwave digestion systems, where each sample requires at least 15 minutes to be prepared.



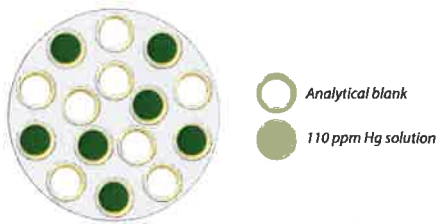
Best digestion quality

Capable of operating up to 199 bar pressure and 300 C, the UltraWAVE enables complete digestions for virtually every sample type, outperforming any other microwave digestion system.



No cross contamination

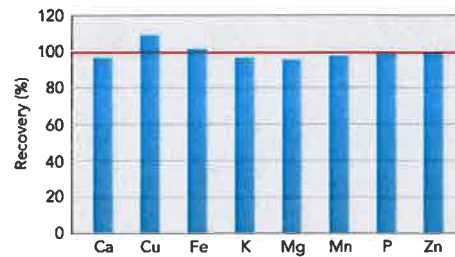
The UltraWAVE does not suffer of any cross contamination among samples. Furthermore, blanks are significantly lower than with conventional microwaves, since less acid is used and vials have a much less surface in contact with the analytical solution.



Uncleaned glass vial blanks digested with 110 ppm Hg solutions placed in adjacent vials, showing no evidence of cross contamination

Position	Sample	Result (ppb)
1	Blank	0.02
3	Blank	0.0032
5	Blank	0.001
7	Blank	<0.001
9	Blank	<0.001
11	Blank	<0.001
13	Blank	<0.001
15	Blank	<0.001

Complete recovery



15 apple leaves samples Sample size 0,5 grams.
Temperature 250 C. Pressure 120 bar.

Lowest residual carbon content

The analysis of the residual carbon content offers a good understanding of the digestion completeness. The UltraWAVE is capable of working at very high temperatures, outperforming any other microwave system.

