MARS 6
MICROWAVE DIGESTION SYSTEM
The Clear Solution
MARS 6 For Digestion

The MARS™ 6 is a microwave acid digestion system that produces clear digestate from samples for elemental analysis by ICP, ICP-MS, or AA. Rocks, plants, soil, foods, pharmaceuticals, plastics, metals, and more can be digested easily, using preloaded methods. For over 30 years, lab technicians have been using MARS systems for sample preparation. With the latest updates to the MARS 6, the process is even easier.

How it Works

Microwave acid digestion is a technique to dissolve metals, bound within a sample matrix, into liquid. This is achieved by exposing a sample to a strong acid, in a closed vessel and raising the temperature and pressure through microwave irradiation. Both the speed of thermal decomposition of the sample, and the solubility of heavy metals in solution are increased. Once these heavy metals are in solution, they can be quantified through elemental techniques. The MARS 6 reduces sample prep time by more than 70%, as compared to traditional techniques.
Pre-installed methods, are one touch away.

By selecting the One Touch™ icon on the MARS 6 touch screen, you’ll be able to choose the sample type from the pre-installed methods. Your method includes the recipe for digestion, including: sample size, acid type, and acid volume. From there, it will automatically detect the type of vessel you are using, count the vessels, adjust the power accordingly, and perform the digestion for you. It couldn’t be easier.

As Easy as...

1. Load your Samples
2. Select your Sample Method
3. Press “Start”
Light Emitting Technology (LET)

Better control means better results.

iWave® is a contactless, in-situ temperature technology that measures the sample temperature of each vessel in real-time. There is no need for a control vessel, fiber-optic probes, or wires. This new innovation utilizes Light Emitting Technology® (LET) that determines the temperature of the actual sample, rather than the vessel.

**Ok**

*(non-iWave)*

IR sensor from side

Accuracy

Convenience

The temperature is measured from the side at a considerable distance between inner and outer rows. The vessel must be filled to a minimum volume (typically 10 mL) in order to be able to measure the signal.

**Good**

*(non-iWave)*

IR sensor from below

Accuracy

Convenience

The temperature is measured from the bottom, in close proximity to the vessel. This provides a more consistent signal and the minimum volume in the vessel can be greatly reduced. IR sensors provide good sensitivity for EPA and other easy to digest materials prepared at moderate temperatures.

**Better**

*(non-iWave)*

IR sensor with fiber-optic probe

Accuracy

Convenience

A probe is submerged, which allows the sample temperature to be measured from the inside of the vessel. This is very accurate, but not very convenient to set up. A single probe is used in a control vessel and all other vessels have to be calibrated against the control vessel.

**Best**

*iWave*

Accuracy

Convenience

iWave is as accurate as an internal probe because it measures the sample and solution directly inside the vessel. It’s like having a fiber-optic probe in every vessel. Every vessel is now a control vessel.
Achieve the accuracy of fiber-optic, with the ease of contactless sensor technology.

Accurate temperature measurement and control is the critical factor in microwave digestion. Achieving precise temperatures reproducibly allows for the digestion conditions to be met and samples to be completely digested time after time.

Probes can be a thing of the past.

Assembling control vessels and making connections are a thing of the past. No more cumbersome assembly of control vessels. No more connecting probes to the microwave. Simply slide the turntable into the cavity and press start.

iWave is as accurate as internal temperature probes.

The data is in. When compared to the industry standard of fiber-optic temperature control, iWave is just as accurate. You get the exact temperature of every sample with precision and simplicity.

Traditional temperature and pressure control options are still available.

For certain applications, fiber-optic, IR, and internal pressure controls are either more cost effective or necessary to operate certain vessel types. All MARS 6 units are capable of fiber-optic, IR, and internal pressure control. Consult your CEM representative to determine what best meets your requirements.
iPrep™ can digest up to 2x more sample per run, and has higher operating parameters than any other vessel. Larger samples ensure homogeneity and increase limits of detection, a plus for any lab.

**Hand Torque Tool**

There’s no need to use a heavy wrench to assemble iPrep vessels. Our custom fit hand torque tool makes it easy to properly assemble the iPrep vessels, while reducing hand fatigue. One click is all it takes to apply the correct amount of torque, everytime; making it impossible to overtighten or undertighten the vessels.

**Dual-Seal Advantage**

The high temperature and pressure conditions afforded by this seal and vessel design provide for the complete digestion of difficult organics, such as PET, bunker oil, organic dyes, toner, thermoplastics, and many other difficult to digest materials.

**2X Capacity**

In addition, its large 110 mL volume allows for larger sample sizes, as compared to other high performance vessels.

**Elemental Integrity**

The dual-seal function provides for unmatched control of the byproducts from digestions such as CO₂ and NOₓ fumes. These are precisely vented outside the vessel, while maintaining the full integrity of all elements, even volatile analytes such as As, Se, and Hg.
**MARSXpress**

The easiest-to-use, high-throughput vessel on the market, this patented, three-piece vessel assembles in seconds. The open turntable design and composite sleeves allow for quick cooling. MARSXpress™, vessels have a self-regulating pressure control, to eliminate the risk of overpressurization.

**EasyPrep Plus**

This high-temperature, high-pressure reaction vessel is simple-to-use. EasyPrep™ vessels have fewer pieces to assemble and do not require membranes or springs for reliable pressure control. EasyPrep style vessels provide high temperature and pressure conditions for difficult matrices.

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<td>Samples</td>
<td>Digests wide range of standard materials</td>
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<td>Digests the widest range of samples at highest sample weights</td>
<td>Can be used with any CEM control option</td>
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| Main Features  | • Simple three-part assembly  
• Open architecture promotes quick cooling |                |                             | • 2x sample size  
• no probes needed  
• easy-to-use |                |                |
| Temperature Control | IR, iWave   | IR, iWave      | IR, iWave                   | IR, fiber-optic, iWave    | fiber-optic, iWave | iWave |
| Vessels        | 40             | 40             | 24                          | 24                        | 12             | 12 or 16 |
| Liner          | TFM            | PFA            | TFM/PFA                     | TFM                       | TFM            | TFM |
| Inserts        | N/A            |                |                             | quartz & Teflon           | Teflon         |                |
| Volume         | 55 mL          | 10 mL          | 110 mL                      | 110 mL                    | 100 mL         | 110 mL |
| Typical Application | EPA methods, environmental, food, pet food, feeds, fertilizers, filters, pharmaceutical, nutraceutical, vitamins, tissue, paint chips, clinical, fertilizers, some polymers and edible oils | All MARSXpress samples plus, geological, ceramics, catalysts, precious metals, catalysts, RoHS materials, coal, slags, oils, polymers | All EasyPrep samples plus bunker Oil, PET, flame retardants, and larger sample sizes |                |    |
### Clean Chemistry

#### LabWare Cleaning System
Clean all of your labware, digestion vessels, and ICP and ICP-MS accessories used for ultra trace analysis in one system.

- Fully automated cleaning procedure, including rinse cycle
- Cleans significantly better than standard cleaning procedures
- Completely sealed system, no airborne contamination, no operator exposure to acids or fumes

#### Acid Distillation System
Make your own ultrapure acids or water for critical analytical applications, reduce background analyte interference, and save money.

- System pays for itself in less than 3 months
- Clean acids mean clean blanks
- Distill up to 40 mL per hour

#### Vessel Inserts
Offered in high purity quartz and Teflon. Only CEM controls the temperature inside the insert, not the solution in the secondary vessel. This provides a more accurate and reproducible digestion.

- Use less acid volume
- Lower dilution factor
- Lower analytical blanks
Monitor and control your MARS 6 from your mobile device.

With the iLink® app, you can monitor your MARS 6 and get results on your mobile device. You’ll be free to move about the lab, and free to focus on other tasks.

How it works

iLink is your 24/7 connection to CEM. Directly connect to CEM from the iLnk home screen. Download manuals, application notes, and reference papers at the touch of a button. You are always connected to CEM support with iLink.

Home Screen Advantage
Easily view the most important stats on the home screen such as power, pressure, temperature, and run status.

Run Multiple MARS 6 systems
Control and monitor multiple MARS 6 systems easily from your mobile device. Functions like Remote Start, Stop, Pause, and Run make it simple.

Documentation
Create lab reports with individual vessel statistics, such as Sample ID, Reagents Used, Mass, Volume, Description, and even photos.
MARS 6 Accessories

**MicroVap**
Reduce your acid volume with the MicroVap™ accessory. The only system that automatically shuts off when final volume is reached. No more guessing. Eliminates boric acid neutralization step when using HF.

**AutoCal**
Simple and fast NIST traceable calibration source for iWave and IR sensors. Calibrate sensors at temperatures up to 175 °C.

**MARSXpress Capping Station**
Provides for rapid and automated capping and uncapping of MARSXpress vessels.

**Anti-Static Ionizer**
Perfect tool for weighing materials into Teflon® vessels. This is especially useful for powdered samples and for laboratories with low humidity.
## Key Features of MARS 6

### Construction
- **Steel Cavity**
  A solid steel cavity construction, using industry leading 316 stainless steel for durability.

- **Acid Resistant Shell**
  A high impact, acid resistant polymer shell that is corrosion proof.

- **Spring Mounted Door**
  A heavy duty spring mounted door that will automatically relieve any pressure from a vessel event.

### Hardware & Software
- **Compliant Software**
  Software is 21 CFR Part 11 compliant for electronic records and signatures.

### Safety Protocols
- **Temperature Control**
  The MARS 6 automatically limits the temperature to a safe range, and adjusts, as needed.

- **Auto Shut-off**
  The PowerMax™ Monitor will shut down the system if full power is applied over a specified time to prevent runaway reactions.

### Ease-of-Use
- **Training Videos**
  On demand training videos are available for viewing on the MARS 6 Display.

- **Touch Screen**
  7-inch glass capacitance, high definition display provides onboard control (no need for external controller or computer).

### Reactiguard
- **The Reactiguard™ cavity sensing device automatically turns off the system if a vessel event occurs.

### Vessel Recognition
- **MARS 6 counts the vessels prior to starting in order to calculate the precise heating conditions required.**

### Data Storage
- **The 8 GB of storage provides more than enough data storage for the lifetime of the system.**

### Ports
- 5 USB ports
- 1 USB-B port
- 2 Ethernet Ports
- 1 RS-232 Port
  (ensures future compatibility)

### Touch Screen
- 7-inch glass capacitance, high definition display provides onboard control (no need for external controller or computer)

### Steel Cavity
- A solid steel cavity construction, using industry leading 316 stainless steel for durability.
Our commitment to you doesn’t end when your system is shipped; it begins.

~Michael J. Collins
President & CEO, CEM