DISCOVER SP-D

PRESSURIZED MICROWAVE DIGESTION
MADE SIMPLE



CEM

Microwave-Enhanced Science

Discover

Microwave Digestion – Made Simple

The Discover SP-D is the most revolutionary microwave digestion system designed since CEM introduced the first system 25 years ago. It is more than the latest technology for microwave digestion: it is a new concept in sample preparation. Discover SP-D is a sequential, pressurized microwave digestion system that processes samples in 10 minutes or less, including cool down! There are no complicated, heavy vessels, no chillers required, and no need to batch samples. For Discover SP-D, simplicity is an integral part of the system, with every aspect of the instrument designed to make it virtually effortless.

Snap on caps for 10-mL and 35-mL vials
No screws, nuts, fittings, or tools needed!

Sequential format with individual method programming
No need to batch samples. Just load the sample deck and go!

Pre-programmed methods
Large application library available with a wide variety of sample types

Fast!
Complete, cooled digestions in 10 minutes

Compact
Saves valuable bench and fume hood space

Advanced Cooling Technology
Cools vials in minutes without chillers or water baths



Microwave Digestion Does Not Get Any Easier Than This!

Samples are run sequentially, which allows different sample types, reagents, and methodologies to be run in any sequence. Each sample vial is run with total pressure and temperature control.

1 WEIGH SAMPLE.



2 ADD ACID AND SNAP ON THE CAP.



3 CHOOSE YOUR METHOD.



10 MINUTES LATER…
A completely digested and cooled sample ready to be diluted!



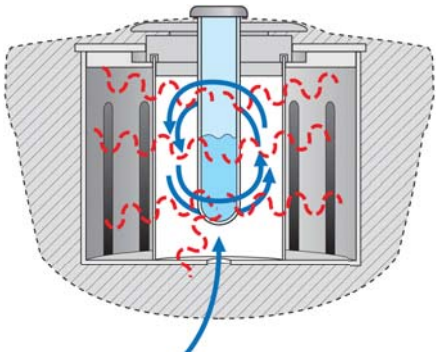
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REVOLUTIONARY TECHNOLOGIES

CEM's team of engineers and chemists continually work together to design technologies that give our systems exceptional performance capabilities and ease of use.

PowerMAX

CEM's patented PowerMAX™ feature makes it possible for the Discover SP-D to introduce a maximum amount of energy to the sample while simultaneously cooling it. This allows the sample to absorb significantly more energy, driving the reaction to completion much faster. It also enables the system to cool the digest more rapidly than traditional microwave digestion systems.



How PowerMAX Works:

Microwave energy is absorbed by the acid and sample, increasing the temperature in the vial. The bulk heat of the solution diffuses into the microwave cavity and is swept away by a continuous flow of air or nitrogen gas, which remains on throughout the entire digestion process. With the bulk temperature of the solution kept lower than normal, more energy can be introduced to the reaction mixture (2 – 3 fold input) to drive the digestion to completion.

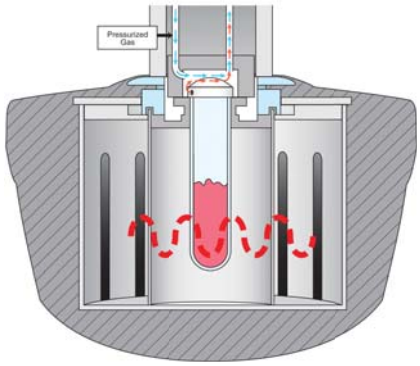
Automated Sample Handling

The Discover SP–D is the first microwave digestion system to offer automated sample handling. Process your samples automatically during work hours or overnight! Just load your samples in the Explorer automation deck, load methods in the Synergy-D software, and press "Play". Return to digested samples that are ready for dilution.



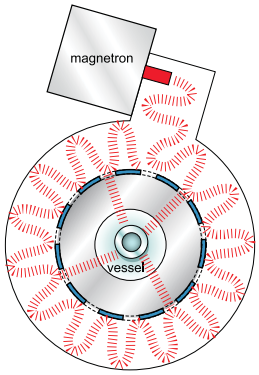
ActiVent

The Discover SP–D is the only microwave digestion system that processes real-world sample sizes in easy-to-use 10-mL or 35-mL vials with snap-on caps. CEM's patented ActiVent™ Technology actively measures pressure and controls venting of the sample vial to prevent loss of elements, including volatiles such as mercury and arsenic.



How ActiVent Works:

As microwave energy is absorbed by the acid and the sample, the temperature increases in the vial. The Discover SP-D actively monitors the increasing temperature and pressure throughout the digestion process. As preselected pressures are reached, ActiVent releases excess pressure from the vial until a preset pressure drop (2 – 4 Bar) is achieved. The vented gas is then swept out of the SP–D with pressurized gas, the system reseals the cap, and the digestion continues. In addition, ActiVent is completely programmable. You choose whether or not to vent during your digestion! If you choose to vent, the venting pressures and the amount of pressure drop are also programmable.



Single-Mode, Focused Microwave Cavity

The Discover SP–D offers a single-mode energy source that provides highly reproducible digestion conditions and a finer degree of control than multi-mode microwave systems, which are well known for having hot spots. The Discover SP-D utilizes CEM's patented Focused™ Microwave Cavity, a self-tuning, single-mode design that produces a highly defined, extremely intense, microwave field that is very reproducible, a characteristic not normally associated with microwave cavities, as multi-mode cavities are widely known to have hot spots. This cavity design intensifies the coupling with acids and enables it to process samples much faster than multi-mode systems, without the need for turntables or diffusers.

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Discover Innovative Features

10 MINUTE DIGESTIONS

POWERMAX™ airflow maximizes microwave power

FASTER COOLING than any other microwave digestion system

AUTOMATED SAMPLE HANDLING OPTION
Available as single-place system or with 48-, 72-, and 96-position decks
Run 10-mL or 35-mL vials
Process samples during a work shift or overnight

HIGH THROUGHPUT
6 samples per hour,
up to 144 samples per day

INDIVIDUAL PROGRAMMING FOR EACH SAMPLE
Flexibility to mix and match any sample types

REAL WORLD SAMPLE SIZE
Up to 0.3g (dry weight) of organic material

AUTOMATED PRESSURE CONTROL

ACTIVENT™ TECHNOLOGY
Monitors pressure and controls venting of excess pressure

TEMPERATURE CONTROL

HF COMPATIBLE
Need to run digestions with HF at times? No problem!

EASY-TO-USE SYNERGY-D SOFTWARE
Electronic documentation of every sample

WIRELESS CAPABILITY & USB INTERFACES
Run system remotely and transfer data quickly



COMPACT
Smaller than box-type microwave digestion systems and saves benchspace!

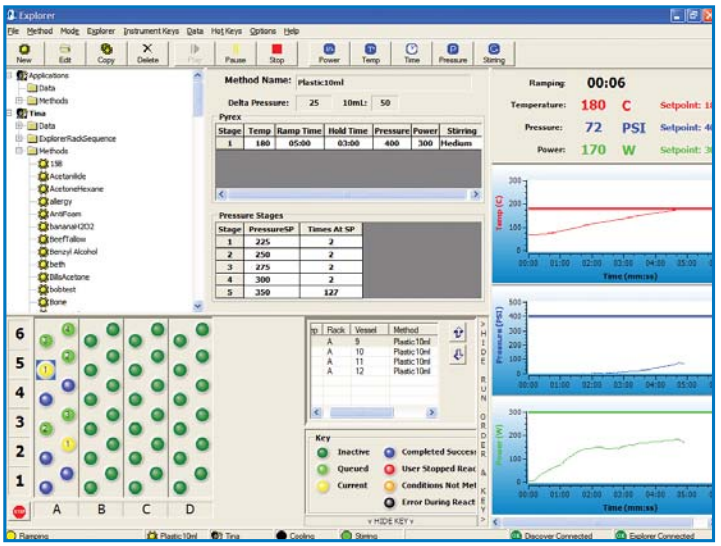


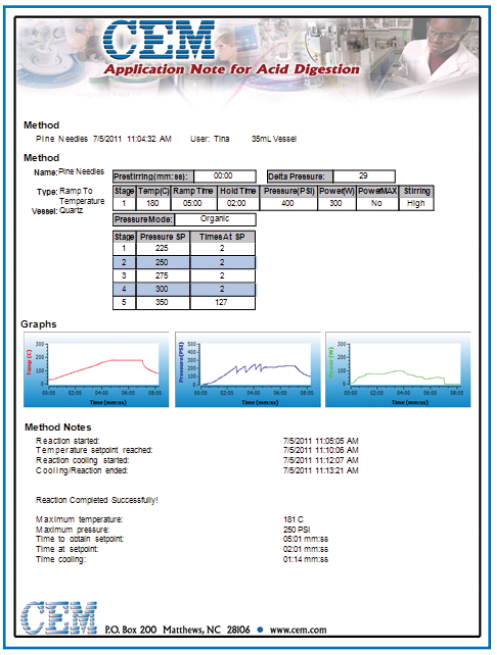
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SYNERGY-D SOFTWARE

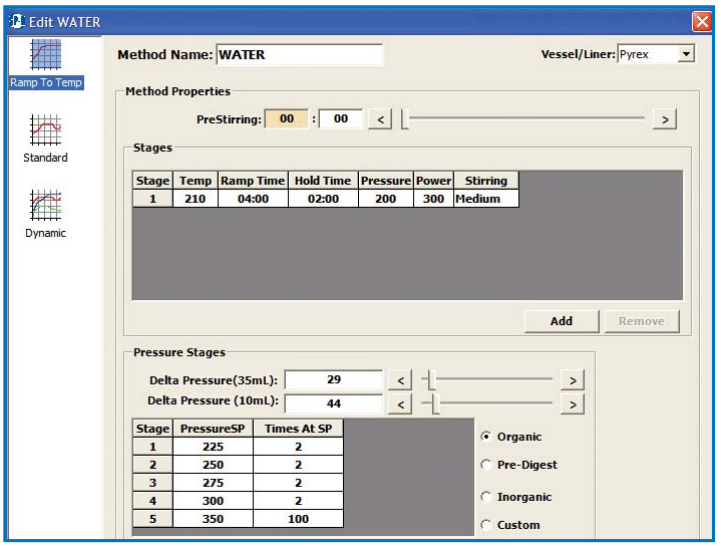
CEM 's Synergy-D software is easy to use, yet powerful and flexible.

- Real-time display of temperature, pressure, and microwave power
- Pre-installed methods for many sample types
- Sample queues that mix methods and sample types in a single run
- Customizable sample reports that contain method and sample parameters; graphs of temperature, pressure, and microwave power; and notes
- Electronic documentation for every sample
- Method creator to customize methods
- Administrative and standard user controls
- Hot keys to modify temperature, pressure, and time during a run





Customizable reports document the digestion conditions of every sample.



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ACCURATE RESULTS

Applications

The Discover SP–D has been designed to digest a wide variety of sample types. Below are just a few of our available applications. For a complete list of applications, please visit us online at **www.cem.com/download19.html** If you do not find your application listed, please contact us.

Pharmaceutical	Food, Plant, and Animal Tissue	Oils and Plastics	Environmental	Inorganic and Metallurgical
Aspirin	Bacon	HDPE	Fertilizer	Aluminum Oxide
Calcium Carbonate	Banana Leaves	Polypropylene	EPA 3051	Cement
Cold-Flu Relief	Beer	PVC	EPA 3052	Ceramic
Folic Acid	Bone	Rubber	RoHS	Clay
Kelp	Cereal	Motor Oil	Paint Chips	Coal Ash
Magnesium Oxide	Cheese	Olive Oil	Sand	Aluminum
Multi-Vitamins	Citrus Leaves	Polymer	Sludge	Copper
Riboflavin	Coffee	Vegetable Oil	Sediment	Gold
Sodium Aluminum Silicate	Infant Formula		Soil	Platinum
Talc	Peanut Butter			Stainless Steel
Zinc Sulfate	Soda			Titanium Alloy
	Tuna Tissue			

ICP-OES Recoveries for Volatile and Non-Volatile Metals

The Discover SP–D processes samples without loss of elements, including volatiles such as mercury, selenium, and arsenic. The table below shows recovery studies for volatile and non-volatile elements in mineral oil, paint, and peach leaves (a NIST standard reference material).

	Mineral Oil		Paint	Peach Leaves – NIST 1547				
Trial	As – ppm	Se – ppm	Lead - ppm	Ba – ppm	Ca – wt. %	Mg – wt. %	Mn – ppm	P – wt. %
1	54.0	51.7	124.9	126	1.55	0.462	92.0	0.138
2	52.9	53.5	121.8	125	1.53	0.463	90.4	0.143
3	52.3	54.2	120.2	126	1.55	0.461	91.6	0.141
4	52.4	50.4	121	127	1.59	0.453	93.6	0.142
5	50.4	52.8	120.2	132	1.72	0.459	99.9	0.152
6	47.6	48.5	120.7	126	1.63	0.439	94.7	0.144
True Value	50.0	50.0	120.0	124	1.56	0.432	98	0.137
Average	51.6	51.9	121.5	127	1.60	0.456	93.7	0.143
% Recovery	103.0	104.0	101.3	102	103	106	96	104
SD	2.28	2.12	1.78	2.53	0.07	0.01	3.40	0.00
% RSD	4.42	4.09	1.47	1.99	4.45	2.00	3.62	3.29

Notes:
Samples were prepared in a quartz vessel.
Sample size was approximately 0.25 grams.

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OPTIONS, and ACCESSORIES

Hoodie Fume Handler – Save valuable fume hood space by processing your samples outside the fume hood!

Note: If Discover SP–D is placed outside a fume hood, a Hoodie Fume Handler option must be used. The hose from the Hoodie Fume Handler must be routed to a fume hood or connected to external piping.

HF Scrubber – Neutralize hydrofluoric acid (HF) fumes as they are vented from the Discover SP–D.

Note: If HF is to be used, a HF Scrubber option must be used. The Discover SP–D and HF Scrubber must be installed and operated in a functioning fume hood.



Hoodie Fume Handler



HF Scrubber



- **Vessels** – 10-mL or 35-mL quartz or Pyrex® vials
- **Caps** – For 10- mL or 35-mL vials
- **Teflon Liners** – Required when using hydrofluoric acid. Available in sizes of 10 mL or 35 mL.
- **Stir Bars** – Required when using the Discover SP–D, available in 2 sizes.



NIST Traceable Calibration Device ensures accurate temperature measurement and complies with the requirements of GLP/cGMP, ISO, and IQ/OQ/PQ documentation.

AUTOMATED SYSTEMS

Whether you run 10 samples a week or 100 samples a day, CEM has a Discover SP–D System to fit your workflow.



Discover SP–D with Explorer 24/48
Run 24 (35 - mL) or 48 (10 - mL) vials



Discover SP–D with Explorer 36/72
Run 36 (35 - mL) or 72 (10 - mL) vials



Discover SP–D with Explorer 48/96
Run 48 (35 - mL) or 96 (10 - mL) vials

Item Description	Part Number
System	
Discover SP-D without Explorer	927130
Discover SP-D with Explorer 24/48	927094
Discover SP-D with Explorer 36/72	927096
Discover SP-D with Explorer 48/96	927098
Synergy–D Software	909107
Options	
Hoodie Fume Handler for Explorer 24/48	909265
Hoodie Fume Handler for Explorer 36/72	909270
Hoodie Fume Handler for Explorer 48/96	909275
Discover SP-D HF Scrubber Option	909400
Calibration Kit	730075
Attenuator (required for 10 mL vials)	526340
Vials, Caps, Teflon Liners, Stir Bars	
35 mL Pyrex vials, box of 25	909036
35 mL Quartz vials, box of 6	909185
35 mL Teflon liner inserts (for HF), box of 10	171968-M
35 mL Caps, box of 25	909350
10 mL Pyrex vials, box of 100	908035
10 mL Quartz vials, box of 6	909190
10 mL Teflon liner inserts (for HF), box of 10	162353-M
10 mL Caps, box of 100	909210
Stir bars, small, box of 50	162810
Stir bars, large, box of 5	909038

INSTRUMENT SPECIFICATIONS

POWER OUTPUT 300 Watt magnetron

PRESSURE Monitor and control up to 500 psi (34 Bar)
ActiVent Self-Venting Technology included
for pressure relief during or after reaction

TEMPERATURE Up to 240 °C control range

AIR COOLING Min 30 psi/2 Bar (3 cfm flow) user-supplied
for simultaneous cooling (PowerMAX)
and rapid cooldown

AUTOMATION 48-position [up to 48 (10-mL) vials or 24 (35-mL) vials]
72-position [up to 72 (10-mL) vials or 36 (35-mL) vials]
96-position [up to 96 (10-mL) vials or 48 (35-mL) vials]

STIRRING Electromagnetic variable speed

OVERALL DIMENSIONS & WEIGHT

WEIGHT 38 lbs (17.3 kg)

DIMENSIONS 14.2"W x 16.9"D x 11.2"H
(36.1 cm x 42.9 cm x 28.4 cm)

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