Phoenix

Phoenix Microwave Muffle Furnaces

Ashing Organic & Inorganic
Loss on Ignition (LOI)
Residue on Ignition (ROI)
Fusions
Heat Treating
Drying
Wax Burn-outs
Melting
Bonding
High Temperature Reactions

CEM

a Heating element placed in furnace walls for optimum heating efficiency

b Dual protection system prevents microwave door from closing without the furnace door in place

c Large display for easy viewing

d Programmable temperature control allows simple single set point temperature or stored multiple stage programs

e NIST-traceable dual thermocouple allows rapid verification and calibration of the furnace temperature for ISO/GLP procedures

f High speed exhaust eliminates need for unit placement in a fumehood

g Furnace temperature uniformity exceeds requirements of standard methods (USP, ASTM, AOAC)

h Use any kind of crucible, including metal!

i Store up to 20 methods

j IR sensor shuts down microwaves in the event of overheating

k Provides safe storage for furnace door Protects operators from hot inner surface

Two furnace configurations available!

High Temperature
1200 °C Furnace holds up to 8 (25-mL) crucibles

High Capacity
1000 °C Furnace Holds up to 15 (25-mL) crucibles Ideal for higher-throughput laboratories

PHOENIX FEATURES

Fast & Efficient
Phoenix Muffle Furnaces perform many high temperature applications up to 97% faster than traditional muffle furnaces, giving you more time to make adjustments to your process and reduce out-of-specification product.

Accurate
Phoenix furnaces satisfy standard methods that require electrically heated furnaces. They have built-in calibration software and NIST traceable accessories are available.

Safe
Phoenix reduces exposure to fumes and heat with a built-in exhaust system that does not require placement of the unit in a fume hood. These rugged, durable furnaces feature door interlocks and built-in system diagnostics.

Easy-to-Use
Auto-start software allows pre-programmable warm-up and shut down. Phoenix furnaces store up to 20 user-programmed methods.

- Up to 97% faster than conventional muffle furnaces
- Accurate results in minutes
- 2 furnace sizes to choose from
- Clean, cool operation
- Rugged and durable
- Reduces exposure to fumes and heat
- Quartz fiber crucibles allow rapid cooling and eliminates risks of burns from handling
- Platinum, porcelain, and graphite crucibles allowed
- Airwave version available
- Sulfated Ashing option available

QUICK & EASY STEPS
ACCURATE ASH ANALYSIS
Doesn't Get Any Easier Than This

1

Select the ashing program for your sample using the keypad on the Phoenix Ashing Furnace

2

Weigh your sample into a crucible

3

Place samples in furnace

4

Press "Start"

REDUCE ANALYSIS TIMES FROM HOURS TO MINUTES

Many diverse industries from food to petroleum products use muffle furnaces to ash both incoming and outgoing product for analysis. Unfortunately, ashing samples in a conventional furnace takes hours to complete. It is often used for quality control, but is impractical for process control. However, a microwave muffle furnace can reduce ashing times to minutes, allowing time for the results to be used for improving process control. You now have time to make adjustments to your process, ensuring a higher quality product and less rework.

Typical Ashing Times

Material Being Ashed	Conventional (Minutes)	Microwave (Minutes)	Time Savings (%)
Butyl Rubber	90	20	78%
Carbon Black	960	90	91%
Cat Food (canned)	300	10	97%
Coal	240	40	83%
Egg (dried yolks)	240	20	92%
Graphite Powder	240	35	85%
Kaolin	120	30	75%
Lactose	960	35	96%
Paper	60	10	83%
Polyester (filled)	480	15	97%
Polyethylene (unfilled)	30	5	83%
Polyethylene (% carbon black)	30	7	77%
Polypropylene	30	5	83%
Poultry (feed)	120	10	92%
Pulp (market)	180	10	94%
Silicon Carbide Mix	120	10	92%
Sludge (municipal)	60	15	75%
Sludge (petroleum)	60	35	42%
Stearates	90	5	94%
TiO_2	60	10	83%

The Phoenix Microwave Muffle Furnace is the third generation of our award-winning line of muffle furnaces. Up to 97% faster than conventional muffle furnaces, the system offers a flexibility not found in conventional furnaces. It provides precise temperature control and accurate results for a variety of applications. Quite simply, it's the fastest, easiest-to-use ashing system you can buy.

Any type of crucible used in a conventional muffle furnace can be used in the Phoenix, including all metal crucibles!

PHOENIX MEETS THE REQUIREMENTS OF ASTM & USP STANDARD METHODS

- ASTM D5630-94 Ash content of thermoplastics
- ASTM D1506-94b Carbon black ash content
- USP 281 ROI (Sulfated Ash)
- USP 733 LOI

PROGRAMMABLE TEMPERATURE CONTROL

Phoenix was designed to produce a uniform temperature throughout the furnace. It is the only microwave muffle furnace which has its heating element placed in the walls of the furnace, giving the Phoenix greater temperature stability.

Programmable and automatic temperature controls are standard on every Phoenix System. Multiple methods may be stored with up to 8 individual ramp, dwell, and hold times per method. Recall any method, any time and use your own method names.

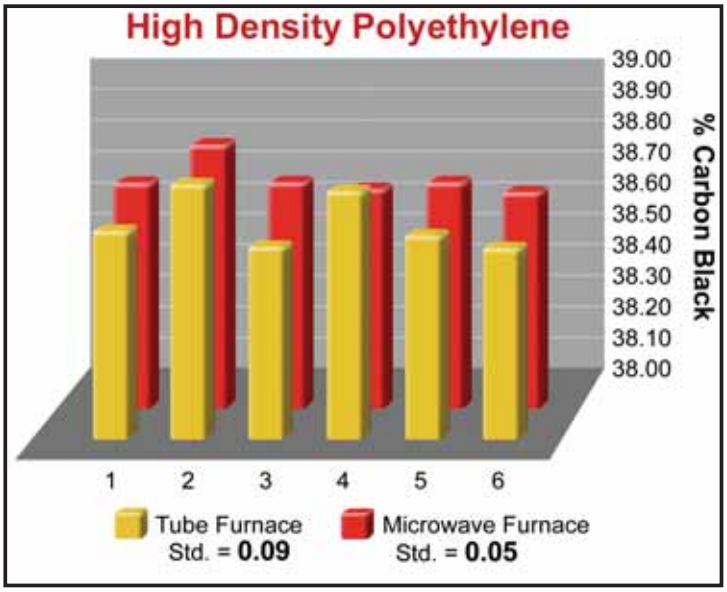
The NIST-traceable dual thermocouple measures air temperature in the furnace center, allowing simultaneous, independent measurement of the furnace chamber temperature. The Calibration Source Instrument, also NIST-traceable, works with the Phoenix software to calibrate the temperature controller with the time and date recorded in the computer memory for display and/or printout.

Use any crucible that may be used in a conventional muffle furnace including platinum.

PHOENIX AIRWAVE

The Phoenix AirWave™ meets the most demanding requirements of large organic samples with ease, and eliminates volume reduction/carbonization on hot plate or Bunsen burner. Using our patented fanless exhaust system, the Phoenix Airwave quickly and safely ashes samples with large quantities of volatile by-products.

- Fast, accurate analysis
- Ash volatile organics, diesel and jet fuel without a Bunsen burner
- Accuracy comparable to standard methods
- Convenient-to-use, easy-to-clean
- Compressed air driven exhaust system will not clog - No moving parts



The Phoenix Airwave provides accurate Carbon Black results in a fraction of the time it takes for conventional furnaces. The standard deviation is also reduced, making the use of nitrogen atmosphere or quartz tubes unnecessary.

ASHING TIMES

Microwave Furnace: 10 mins Conventional Furnace: 145 mins

PHOENIX WITH SULFATED ASHING OPTION

Ash pharmaceutical raw materials, excipients and finished products in minutes, while safely removing and neutralizing sulfur dioxide and nitric acid emissions to meet ISO 14000 regulations.

- Meets requirements for USP 281 (ROI) & USP 733 (LOI)
- Full documentation of method, completion date, and time
- Rapid disconnect feature allows system to be used as either a standard ashing system or a sulfated ashing system in less than 5 minutes without the use of tools
- Quartz furnace ceiling assures sample purity

PHOENIX WORKSTATION

All Phoenix Systems are available as a workstation, including balance, and printer (not shown). The Phoenix Workstation option transforms your microwave muffle furnace into a complete center for accurate ashing and data compilation for complete documentation of the ashing process to assist you in complying with ISO and other QC requirements.

Accessories for the Phoenix Ashing Systems

CALIBRATION SOURCE INSTRUMENT (NIST traceable)

The calibration source instrument and built-in system software allow rapid calibration of the temperature control circuitry of the Phoenix Ashing Systems. An NIST traceable certificate of calibration is supplied with the instrument.

DUAL ELEMENT THERMOCOUPLE (NIST traceable)

The type K Dual Element Thermocouple contains two thermocouples in one sheath. While one thermocouple controls the operating temperature, the second thermocouple can be connected to a digital thermometer to verify the accuracy of the controlling thermocouple. It is NIST traceable with a certificate of calibration.

COOLING FAN

The furnace cooling fan rapidly reduces heat to the starting temperature.

BALANCE

The 110g or 210g balance with 0.1mg sensitivity.

PRINTER

Documenting analysis data is convenient using a multicolor printer available from CEM.

CEM Crucibles & Caps

Faster Ashing, Cools in seconds

Phoenix microwave muffle furnaces can use any crucible that may be used in a conventional muffle furnace (including platinum), but it's hard to beat our patented quartz fiber crucibles for speed, convenience and safety. The quartz fiber material allows oxygen to circulate around the sample dramatically reducing ashing times and cools in seconds, eliminating crucible burns.

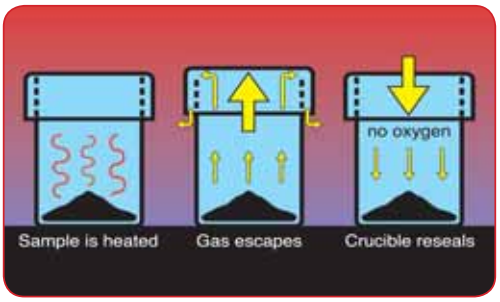
- Increase rate of sample oxidation
- Withstands temperatures up to 1,000 °C
- Disks are available to cover samples and prevent sample loss
- Unbreakable
- Reusable with liner disk
- Safe! Cools in seconds
- No need for desiccation
- Available in 20-, 50- or 100-mL sizes

Quartz fiber crucible caps are also available and can be used with our 50- or 100-mL crucibles.

- Ideal for low ash samples and samples with high organic content
- Contains the sample when ignition occurs
- Reduces contamination
- Improves accuracy on ROI and LOI determinations

Self-Sealing Quartz Crucibles

For oxygen-free ashing, self-sealing quartz crucibles are available. Ideal for applications such as carbon black determination in polyethylene and polypropylene.



ASH SAMPLES IN AS LITTLE AS 7 MINUTES

Phoenix for Bone Content Analysis
Direct analysis in less than 15 minutes without titration

Forget titrations and back calculations for bone content. Get a fast, accurate and direct bone content analysis with the Phoenix Microwave Furnace. Save money and increase production yields by running closer to target.

- Fast, direct method
- More accurate than titration
- No chemicals
- Automatically calculates results

Sample	% Bone	AOAC Bone	Difference
1	0.77	0.83	-0.06
2	0.70	0.76	-0.06
3	0.80	0.62	0.18
4	0.86	0.51	0.35
5	0.59	0.55	0.04
6	0.64	0.56	0.08
7	0.79	0.50	0.29
8	0.50	0.50	0
9	0.83	0.85	-0.02
10	0.85	0.88	-0.03

Bone Content Results: Mechanically Separated Chicken (MSC)

SYSTEM SPECIFICATIONS

Emission and Safety Approvals
U.S. and Canada Emissions & Safety

Complies with FCC part 18 (47 CFR part 18 Industrial, Scientific and Medical Equipment)
US: ETL* approved to UL standard 3101 (laboratory equipment)
Canada: ETL** approved to standard CAN/CSA C22.2 No. 1010.1 (laboratory equipment)

European Community Emissions & Safety
Conforms to EC standard EN 55011 (Emissions for Industrial, Scientific, and Medical Equipment)
Conforms to EC standard EN50082-2 (Electromagnetic Compatibility – Part 1)
Conforms to EC standard IEC 1010-1
(Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1)

Temperature Capabilities	
High Temperature Furnace	1200 °C
High Capacity Furnace	1000 °C
Electrical Ratings	208-230 VAC, 60 Hz, 10 amps 220-240 VAC, 50 Hz, 10 amps Universal tap switch allows electrical voltage to be switched from 208 to 230V, or 220 to 240V
Power Output	1350 watts +/- 50 watts (at nominal line voltage)
Magnetron Frequency	2455 MHz
Exhaust Capabilities	Phoenix: 130 CFM Phoenix AirWave: 130 CFM (adjustable)
Balance Interface	RS-232, 9-pin serial interface
Printer Port	25-pin parallel
Computer Interface	RS-232, 9-pin serial interface (PC software to interface and collect data must be supplied by the user)
Overall Instrument Dimensions	Phoenix: 46.2(W) x 65.4(D) x 49.8(H) cm 18.2(W) x 25.75(D) x 19.6(H) in Phoenix AirWave 56.9(W) x 76.3(D) x 50.3(H) cm 22.2(W) x 29.75(D) x 25.7(H) in
Furnace Chamber Volume	
High Temperature Furnace	1.8 liters (112.5 in^3)
High Capacity Furnace	5.0 liters (263.4 in^3)
Furnace Chamber Dimensions	
High Temperature Furnace	21.0(W) x 11.6(D) x 7.6(H) cm 8.25(W) x 4.5(D) x 3.0(H) in
High Capacity Furnace	24.61(W) x 16.84(D) x 10.41 cm 9.69(W) x 6.63(D) x 4.1(H) in
Unit Weight	44.2 kg (97.5 lbs)

*ETL and UL are equivalent nationally recognized testing laboratories.
**ETL is an approved testing laboratory by the Standards Council of Canada.

CEM has been an ISO-certified facility since 1994.

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