



MILESTONE
H E L P I N G
C H E M I S T S



PYRO

Microwave Ashing System

PYRO SA

Sulfate Ashing Microwave Ashing System

PYRO *microwave ashing system*

The drawback of conventional ashing furnaces

The determination of ash content, whether for process control or as a preparation method for other analytical techniques, is an important test performed daily in thousands of laboratories.

While ashing is a relatively simple process, conventional muffle furnaces are inefficient in a number of respects which often leads to the process being tedious and time consuming.

An alternative to muffle furnaces, electrical resistance furnaces, are typically costly to maintain due to high energy consumption. Additionally, both of these types of instruments have a tendency to diffuse heat making the surrounding laboratory environment uncomfortable due to heat and odors.

Introducing the Milestone PYRO

The application of microwave technology to dry ashing procedures has represented a breakthrough in the process and quality control of samples like polymers, petroleum, food and feeds, pulp paper and pharmaceuticals.

Milestone offers two microwave ashing systems to meet the needs of your laboratory.

The PYRO dramatically reduces ashing times: it is able to ramp from room temperature to 800 degrees in less than 30 minutes.

The PYRO SA is identical to the PYRO, but it is equipped with an additional module specially engineered for sulfate ashing procedures.

The PYRO systems' unique design eliminates equipment corrosion and acid fume pollution, greatly reducing analyst exposure to acid fumes.

These units offer you the fastest, cleanest, most versatile way to ash a wide variety of samples.



PYRO *technical features*

How it works

A special microwave-transparent ceramic muffle furnace allows microwave energy to pass through and rapidly raise the temperature of silicon carbide plates located inside the muffle.

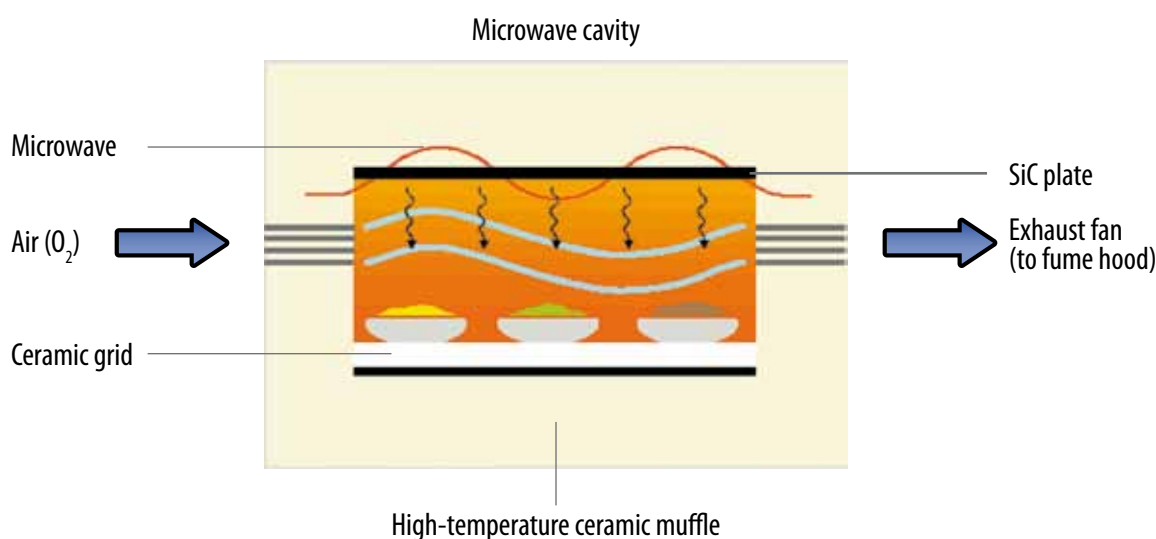
Porous ceramic honeycomb frits built into the side walls of the muffle furnace allow a constant stream of air to pass over the sample crucibles.

The combination of microwave "superheating" and the oxygen from the air flow results in a dramatic reduction of ashing times.

A high-precision thermocouple located in close proximity to the bottom of the ashing crucibles (and unaffected by the airflow) monitors temperatures inside the furnace.

The thermocouple's signal is used as a feedback control mechanism to regulate microwave power output and maintain the user selected ramping/ashing temperature.

The high-efficiency microwave energy coupling characteristics of the silicon carbide heating inserts allows the use of any type of crucible (metal, porcelain, quartz, etc.) within the microwave furnace.



User interface

The PYRO is run by an advanced touch-screen controller with a large graphic interface.

The EasyCONTROL software offers you simple, user-friendly, intuitive operation.

Sophisticated PID algorithms will follow your preset temperature curve and allows you to modify all parameters, even in the middle of a run.

Milestone's new EasyCONTROL software is the most advanced and powerful operating system in the field of microwave sample preparation.

Automatic, real-time monitoring and feedback-based control of multiple parameters offers unsurpassed process control.

Simply recall a factory stored program or create a new one.

Press 'Start', and the system will automatically follow the defined temperature profile, utilizing a sophisticated PID algorithm.



- Monochrome touch-screen industrial grade controller 5" screen
- Resolution 240 x 128 dots for sharp process graphics
- 1 PS2 port for mouse, 1 RS 485 port for microwave unit, and 1 RS 232 port for external devices
- Methods and process reporting data saved on internal memory

PYRO *benefits*

Reduced operating costs

The PYRO has an extremely fast heating rate.

A typical ashing temperature of 800°C can be reached in less than 30 minutes from room temperature.

This eliminates the necessity of running the system overnight, and avoids the lengthy heat up times associated with electrical resistance furnaces, dramatically lowering average power costs.

High sample throughput

The PYRO has an extremely large working cavity area.

You can easily accommodate up to twelve standard 40 mm wide crucibles at a time.



Short Ashing Times

| Sample | Ashing Temperature (°C) | PYRO Ashing Time (minutes) | Traditional Ashing Time (minutes) |
|------------------------------|-------------------------|----------------------------|-----------------------------------|
| <i>Pet food (ground)</i> | 575 | 21 | 90 |
| <i>Cat food</i> | 575 | 15 | 90 |
| <i>Polypropylene</i> | 650 | 22 | 80 |
| <i>PVC</i> | 900 | 15 | 120 |
| <i>Polyester</i> | 600 | 15 | 480 |
| <i>Polyurethane</i> | 900 | 15 | 120 |
| <i>Coal standard AR 2782</i> | 750 | 20 | 120 |
| <i>Dried egg yolk</i> | 925 | 25 | 240 |
| <i>Activated coal</i> | 750 | 25 | 180 |
| <i>Flour</i> | 900 | 50 | 360 |
| <i>Salami</i> | 600 | 60 | 300 |

More comfortable working conditions

No heat added to the laboratory.

The special microwave-transparent ceramic muffle furnace is an outstanding insulator, minimizing heat loss and transfer to the surrounding area.

The ambient temperature of a laboratory will be unaffected, even when the unit is running at its highest temperatures.

No odors added to the laboratory.

The combustion of samples containing organic matter often generates noxious odors.

The built-in exhaust system of the PYRO removes fumes from the interior of the furnace and directs them through an exhaust hose to a fume hood or other outlet.

Unpleasant odors from the ashing process are eliminated from the lab environment.

The unique PYRO SA

Ashing of pharmaceutical, polymer, and food samples often involve the use of H_2SO_4 . Hot sulfuric acid vapor released during these procedures is hazardous to analysts and corrosive to equipment. Additionally, sulfate ashing methods are labor-intensive and time-consuming, requiring manual fuming of acid from crucibles and 8-12 hours to be completed.

To overcome these issues, Milestone has developed the PYRO sulfate ashing microwave system.

The PYRO SA enables analysts to add H_2SO_4 to samples and place crucibles directly into the microwave muffle furnace without a preliminary charring step.

Tedious handling of samples and operator exposure to acid fumes are eliminated.

The system is designed for complete operator safety and long life, and performs the complete sulfate ashing procedure in only 60-90 minutes.

Sulfuric acid fumes released from crucibles are continuously removed, through a quartz tube connected to an air-cooled quartz collection vessel outside the unit, and to the VAC-1000 acid scrubber module.

The PYRO SA is operated via a compact terminal with bright, full-color, touch-screen display, which runs the Milestone's unique EasyCONTROL software, to provide simple, user-friendly control of the microwave sample preparation process.

Methods and runs are saved on a removable flash-card or on a USB pen-drive.

Typical Sulfate Ashing Times

| Sample | Ashing Temperature (°C) | PYRO SA Ashing Time (minutes) | Traditional Ashing Time (minutes) |
|----------------------|-------------------------|-------------------------------|-----------------------------------|
| <i>Lactose</i> | 600 | 60 | 480 |
| <i>NTF</i> | 800 | 50 | 480 |
| <i>Cellulose</i> | 800 | 80 | 500 |
| <i>Antibiotics</i> | 850 | 65 | 480 |
| <i>Tartaric acid</i> | 800 | 80 | 500 |



PYRO and PYRO SA specifications

Microwave hardware

- Single magnetron system with rotating diffuser for homogeneous microwave distribution in the cavity
- Magnetron protected from reflected microwave power
- Stainless steel metal door
- Output power up to 1200 watt, controlled via microprocessor
- Temperature range 20-1200° C
- Microwave cavity entirely made of 18/8 stainless steel housing
- Large microwave cavity 37 x 34,5 x 33,5 (h) cm
- Muffle volume 3,3 litres
- Muffle dimensions 242 x 162 x 84 (h) mm
- All hardware protected against acids/organic solvents with polymer coating both on inside and outside surfaces
- Total of safety interlocks 4 micro-switches to prevent microwave emission with door open
- All-metal high-flow exhaust system
- Acid scrubber module with high-performance double stage PTFE pump
- Rated 20 mbar vacuum and 40 l/minute flow rate (PYRO SA only)
- Weight ~ 75 kg.
- External dimensions 57 x 51 x 61 (h) cm.
- Power 220V/50-60Hz, 2,4 kW.

PYRO Control terminal

- Monochrome touch-screen industrial grade controller 5" screen
- Resolution 240 x 128 dots for sharp process graphic
- 1 PS2 port for mouse, 1 RS 484 port for microwave unit, and 1 RS 232 port for external devices
- Methods and process reporting data saved on internal memory
- External dimensions 22 x 14 x 5 (h) cm

PYRO SA Control terminal

- Touch-Screen- industrial grade controller 6,5" screen with 65.000 colours
- VGA resolution 640 x 480 for sharp process graphics
- 1 USB port to connect printer, 2 PS2 ports for mouse and keyboard
- 3 RS 232 ports for external devices
- Methods and runs saved on Windows™-compatible removable flash-card and USB pendrive

Standard methods compliance

- ASTM D5630-94 (Standard Test Method for Ash Content in Thermoplastics)
- ASTM D1506-99 (Standard Test Methods for Carbon Black-Ash Content)
- U.S. Pharmacopeia Methods USP 281 (Residue on Ignition) (Sulfated Ash)
- U.S. Pharmacopeia Method USP 733 (Loss on Ignition)
- SEMI F48-0600 (Test Method for Determining Trace Metals in Polymer Materials)

Specifications are subject to change without notice.

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