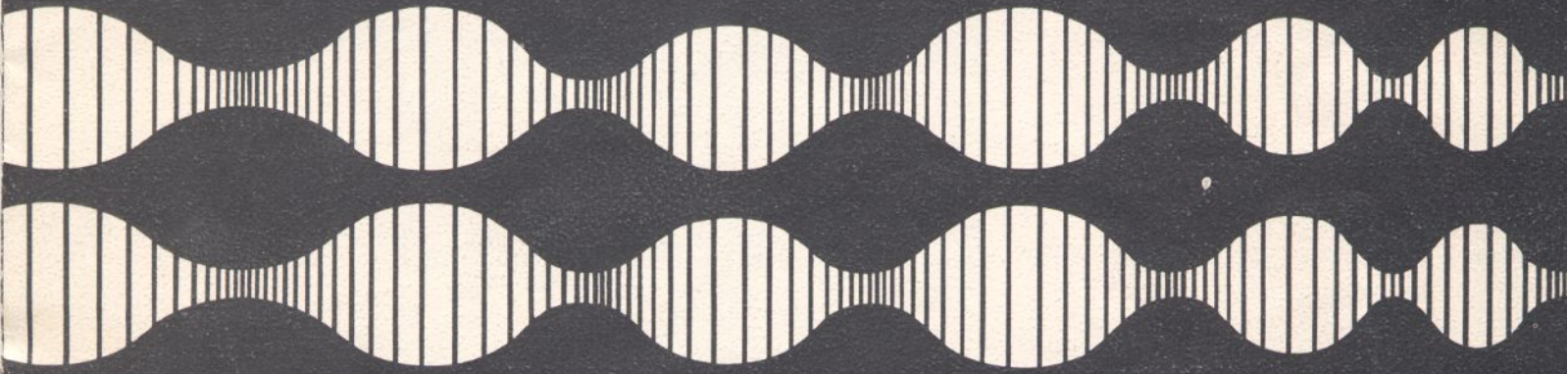


apollo

**MICROWAVE LABORATORY
FOR
INGREDIENT DETERMINATIONS**



**... Production Control
... Quality Control
... Research**

Six Models for

STANDARD 10 GRAM UNIT

This unit is recommended when the density of the material being tested is such that a smaller sample can be used to make the test. The density of the material determines the amount of material required to make an accurate test.



Each Model Available with Suspended Vacuum System

Each of the models are available with a suspended, inverted bell jar vacuum system. The models are designated as Vacuum 10, Vacuum 100, and Vacuum Analytical.

With this system, moisture can be removed, at a lower temperature, from samples which are heat sensitive. In this suspended system, the weight reading from the balance can be taken immediately after the vacuum action has stopped so there is no recombination of water with the dried sample.

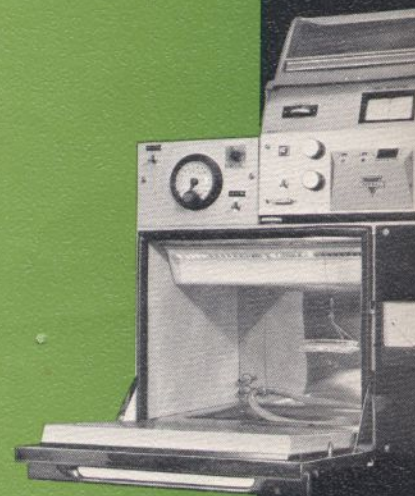
STANDARD 100 GRAM UNIT

For testing materials with lesser density, requiring a larger sample for accurate results. It also has an automatic feature that shuts off the unit as soon as all moisture is gone and before the next volatile starts to leave the material. There must be at least 50 grams of bulk in the sample for the dielectric properties to function in activating the automatic shut-off. The computer is a volatilization control. It compares energy absorbed by the sample over a given time base. An automatic alarm is sounded alerting the operator to take a reading.



ANALYTICAL 160 GRAM UNIT (.001 gm. readability)

When closer tolerances are required . . . this unit utilizes an analytical balance reading in thousandths.

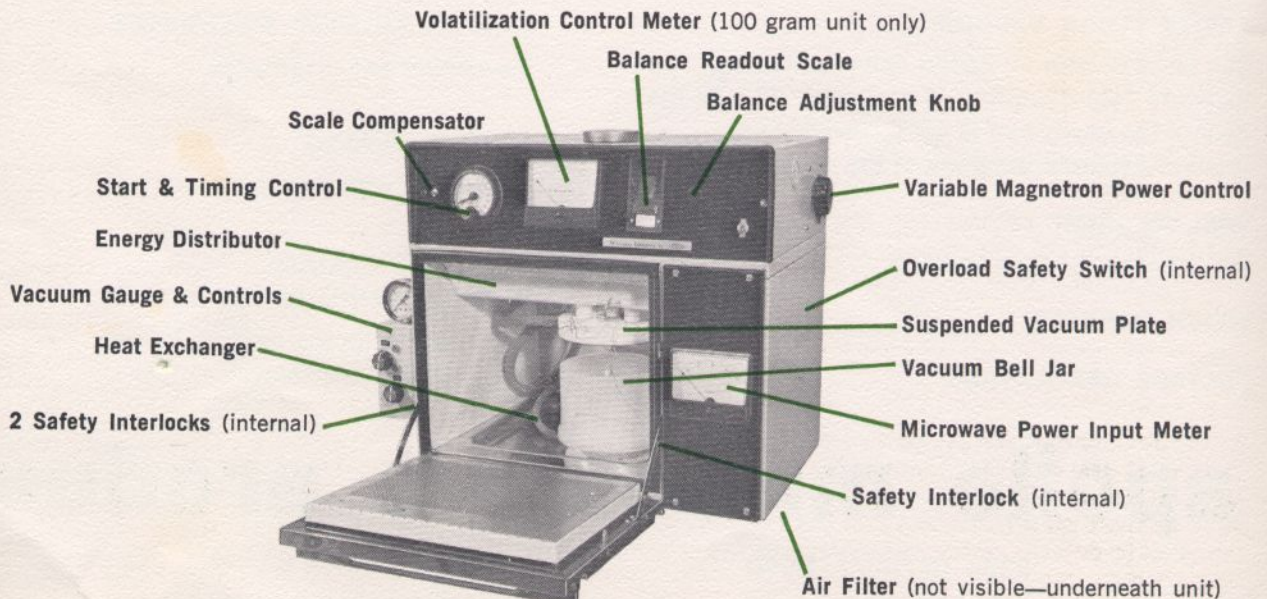


Full Range Capability

There are three basic type-size APOLLO instruments. They are the Standard 10 Gram Unit, the Standard 100 Gram Unit and the Analytical 3 Place Balance Unit. In addition, there is a separate model of each type-size available with a suspended vacuum chamber in the cavity. The vacuum model is required when the product being tested releases moisture so rapidly the material tends to burn.

All the elements in the Apollo are field proven components. Similar high power magnetron type microwave power supplies were used by the military during World War II. After security restrictions were lifted in the 50's, microwave energy as we know it now, was developed for industrial uses.

Apollo's magnetron power train is an electromagnetic structure unlike the permanent magnetic variety found in many domestic type ovens. The average energy transfer efficiency obtained with the Apollo is in the neighborhood of 70%. The precision balance incorporated in Apollo is accepted in laboratories where precise results are needed for delicate measurements. Apollo's patented method of coupling a suspended balance platform within the microwave cavity permits the measurement of weight loss without problems of moisture recombination. The unique eddy-current type balance dampening mechanism eliminates many problems which might arise because of improper instrument leveling or other adverse conditions caused by location of instrument in the plant.



DRYING AT LOWER TEMPERATURES

When a product is exposed to microwave energy, heat is selectively generated within the molecular structure of the water itself. Thus, high temperatures resulting from heat conduction to the center of the sample are eliminated. The tendency for samples to char, crust, or otherwise deteriorate is greatly reduced.

LEVELING OF MOISTURE

Due to the attraction that water has for microwaves, the regions within any mass having the highest moisture content automatically absorb the greatest amount of microwave energy, and consequently tend to heat most rapidly. Moisture gradients begin to level as the internal moistures are driven from hotter (wetter) regions to cooler (drier) regions within the mass.

The common practice of overdrying, in order to produce a moisture level that is sufficiently low to allow for ultimate moisture tempering in the finished product, is no longer necessary. Products may actually be sold with higher average moisture content in many cases, because moisture control through the use of microwave energy provides a more accurate and reliable product quality.

EFFICIENT HEATING

Microwave energy has a strong affinity for water. Other solvents and solids are attracted to microwaves in keeping with their respective degrees of polarity/dielectric absorption. During the moisture drying applications, for example, the energy applies directly to the liquid and thereby eliminates the need for heat transfer. This minimizes over-heating of the solid-material content, and overcomes non-uniform drying effects.

INCREASE IN RATE OF DRYING

Many production processes are limited by the rate of heat transfer that is imposed by the conventional drying method being used. In such instances microwaves offer a means of increasing production rates significantly. Because microwave heating incurs no heat transfer lag, the vapor pressure gradients that are generated internally can respond to more effectively increase mass transfer rates.

SOLIDS DETERMINATION

With samples that are primarily liquid, such as milk, purees, slurries, paints, chemicals and others, the percent of solids can be quickly determined. The Apollo drives off all volatiles and the residue is weighed to determine the percentage of the original sample remaining.

Specifications and Operational Information

SPECIFICATIONS:

(Manufacturer reserves the right to make changes in future production)

POWER REQUIREMENTS

Volt/Cycle 115/60
Watts 1600
Amps 14.5

LAMPS

Scale dial 15 watt
Oven cavity 25 watt (25T 6½)

AIR FILTER Cleanable

EXTERIOR DIMENSIONS (in inches):

Height (Including feet w/balance mechanism mounted) 22¾
Width 22¼
Depth (over-all) 17½

USABLE OVEN DIMENSION (in inches):

Height 11½
Width 14¾
Depth (w/door closed) 13¾
Completely air-cooled — no water or drain connections required

SHIPPING WEIGHT (in lbs.) 150

NET WEIGHT (in lbs.) 122

Licensed under applicable Ramex patents and patents pending.

The Apollo meets all applicable government regulations pertaining to microwave energy, including Federal Communications Commission type approval.

HEAT EXCHANGER

A heat exchanger is utilized to increase accuracy and to protect the life of the instrument. The heat exchanger provides a constant energy load by recirculating a controlled volume of water through the cavity. This not only increases the life of the unit, but makes it an accurate and truly heavy-duty performer.

SAFETY

Multiple safety interlocked switches are provided so there is no possibility of energy escaping . . . the instrument shuts off immediately when the door is opened. In addition, many interconnect and operating features are covered by patents or patents pending.

VARIABLE POWER CONTROL

The microwave energy that is supplied to the cavity of the Apollo unit can be varied according to the requirements of the sample being analyzed. This unique feature results in actually varying the microwave power generated by the magnetron without affecting the microwave frequency of 2450 megahertz around which the entire unit was designed. While most domestic and commercial microwave ovens utilize a permanent magnet in the design of their generating unit, the Apollo uses an electromagnetic system to accomplish this stable variability of power.

Maintaining Maximum Allowable Moisture During Processing Boosts Quality . . . and Profits!

Increasing productivity is a key goal in all of industry and the APOLLO affords a rare opportunity to take advantage of productivity that is already inherent in your process flow. Because the APOLLO makes an accurate moisture determination in minutes you can change formulation to maintain the maximum allowable moisture in your product.

The Apollo was developed by scientists who have pioneered the use of microwave drying and heating. Because the acknowledged precise method of making a moisture determination is to thoroughly remove all of the moisture by drying the product, it was natural to look to microwave energy for a quick method. Drying in a conventional heat oven generally requires hours, as long as 24 hours for some products, while drying with electromagnetic microwave energy can always be accomplished in minutes. Consequently, companies using the Apollo as a quality control instrument can make moisture determinations fast enough to adjust product formulation to assure that the finished product contains the maximum amount of moisture for best product quality.

Exhaustive laboratory tests have been made on hundreds of products under actual production conditions for more than four years in varied industries. Operation of the instrument is simplicity in itself . . . all you do is place the sample to be tested in the cavity . . . set the instrument . . . close the door and press the start button. Even the preparation of the sample is simple, there is rarely a need to grind it and you do not need precise samples as conversion charts are furnished with the instrument. Also, a conversion formula interfaced to a standard electronic calculator can be provided.

PRODUCTION CONTROL

When moisture content of a finished product is critical, the Apollo Moisture Laboratory makes exact moisture percentages so quickly that constant surveillance can be effected throughout the entire process line. The unit is durable, simple to operate without trained operators, and can be easily moved from production control laboratory to the production line . . . even to the warehouse to test moisture in stored finished goods.

QUALITY CONTROL

Apollo can greatly expedite product incoming and outgoing inspections. It will correlate to existing laboratory standards, delivering results in minutes instead of hours.

RESEARCH LABORATORIES

The Apollo speeds up research activities during the development of new products when ingredient content is a critical factor. Methodology can be developed with quicker tests for future use in the quality control department.

TYPICAL PRODUCT TESTING RESULTS

Products	Approx. Moisture	Approx. Time	Type Machine
DAIRY PRODUCTS			
Skim Milk	93.%	2 min.	vacuum
Dry Milk	3.0	3 min.	vacuum
Butter	16.	4 min. 30 sec.	10 gram
Cheese—Processed or cheese food	43.5	2 min. 45 sec.	10 gram
Cheese—natural	37.	3 min.	10 gram
Cheese—cold pack	55.	3 min. 30 sec.	vacuum
Cottage Cheese (wet)	77.	4 to 6 min.	10 gram
Cottage Cheese (dry)	8.0	15 min.	10 gram

Products	Approx. Moisture	Approx. Time	Type Machine
CEREALS AND GRAIN			
Flour	5.1	1 min. 30 sec.	10 gram
Corn Meal	8 to 10	3 min.	10 gram
Shredded Wheat (wet)	45.	10 min.	vacuum
Grits	16.2	2 min. 20 sec.	10 gram
Farina (raw)	9.3	2 min. 58 sec.	vacuum
Cream of Wheat	8.6	5 min.	10 gram
Apple and Cinnamon cereal	6.4	5 min.	10 gram
Maple Cereal	9.9	6 min.	10 gram
Corn Cobs	16 to 33	4 to 6 min.	100 gram
Wheat Crunchies	2.6	1 min. 25 sec.	vacuum
Other Cereal	3.1	3 min. 30 sec.	vacuum

Products	Approx. Moisture	Approx. Time	Type Machine
MEAT PRODUCTS			
Sausage	40 to 60	4 to 8 min.	100 gram
Pork (raw)	30 to 40	4 min. 30 sec.	100 gram
Beef (raw)	55 to 70	6 min. 30 sec.	100 gram
Other Meat	30 to 70	4 to 8 min.	100 gram

Products	Approx. Moisture	Approx. Time	Type Machine
POWDERS AND SUGAR			
Bar B Q Spice	4.8	4 min. 30 sec.	10 gram
Paprika	10.5	3 min. 15 sec.	10 gram
Chili Powder	9.8	3 min. 45 sec.	10 gram
Powdered Onion	4.6	2 min.	10 gram
Mincned Onion	4.7	1 min.	10 gram

Products	Approx. Moisture	Approx. Time	Type Machine
POWDERS AND SUGAR (Cont'd.)			
Soy Albumen	4.0	2 min. 30 sec.	10 gram
Carmel	12.0	1 min.	vacuum
Nougat	9.2	1 min. 15 sec.	vacuum
Cocoa	4.0	3 min. 30 sec.	10 gram
Sugar	8.6	5 min.	10 gram
Steepwater	44.6	2 min. 45 sec.	vacuum
Dextrose	0.3	3 min.	vacuum
Animal Feeds	10.0	4 min.	10 gram
Animal Meal	10.3	3 min. 30 sec.	10 gram
Licorice	4.0	2 min. 30 sec.	vacuum

Products	Approx. Moisture	Approx. Time	Type Machine
CHEMICALS, RUBBER AND PLASTIC			
Rubber	1.5	1 min.	10 gram
Rubber Compound	1.0	1 min.	10 gram
Paint	17 to 25 solids	1 min. 30 sec.	10 gram
Carbon Black	18	45 sec.	10 gram
Chemical—jell	41.5 solids	2 min.	10 gram
Chemical—liquid	65.2 solids	2 min.	10 gram
Chemical—with added methanol	47.6 solids	5 min.	10 gram
Chemical—white liquid	63.5 solids	2 min.	10 gram
Polyester Fiber	2.1 to 2.9	1 min.	10 gram
Polyester Bead	0.1 to .45	1 min.	10 gram
Coal (soft)	25 to 30	3 min.	100 gram
Coal (anthracite)	12 to 15	4 to 6 min.	100 gram
Wax	17.0 solids	3 min.	10 gram
Polymer	20 to 21. solids	5 min.	10 gram
Shaving Cream	17.0 solids	3 min.	10 gram
Chemical Detergent	65 to 75	1 to 2 min.	10 gram
Dishwasher Detergent	8.9	10 min.	10 gram
Paper (raw)	9.2	3 min. 30 sec.	10 gram
Paper (coated)	6.8	3 min. 30 sec.	10 gram

Products	Approx. Moisture	Approx. Time	Type Machine
OTHER PRODUCTS			
Tobacco (raw)	44.0	2 min. 30 sec.	100 gram
Tobacco (chopped)	18.0	2 min. 30 sec.	100 gram
Cosmetics	15 to 95	3 to 5 min.	vacuum

COMPUTER INTERCONNECT

An interface is available to connect the Apollo Microwave Laboratory directly to your computer or to digital printout equipment.

ACCESSORIES AVAILABLE

CAVITY FLOOR VACUUM

Can be used with all Apollo units for making moisture determinations in a vacuum. Fits on the floor of the cavity and is not suspended so requires separate weighing of the sample.

VACUUM PUMP

For use with the floor vacuum.

WEIGH BASKETS

VOLTAGE REGULATORS

SAMPLE HOLDING CONTAINERS

Permanent and disposable.

SPECIAL TUBING

To be used with the heat exchanger.

CONSTANT VOLUME

RECIRCULATING WATER PUMPS

To be used with the heat exchanger. Supplied with instrument.

apollo microwave products

6204 OFFICIAL ROAD
P.O. BOX 362

CRYSTAL LAKE, ILLINOIS 60014
PHONE: 815/455-0314