

LABMASTER GROUP 1000 - General Specifications

FURNACE DATA

Hot Zone Size	Model	Max Temp in Helium	Power Supply
2.0" dia. x 6" long (51 mm x 152 mm)	1000-2560-FP20	2900° C	20 kVA
2.0" dia. x 12" long (51 mm x 305 mm)	1000-25120-FP30	2400° C	30 kVA
2.0" dia. x 18" long (51 mm x 457 mm)	1000-25180-FP30	2300° C	30 kVA
2.5" dia. x 6" long (63 mm x 152 mm)	1000-3060-FP20	2800° C	20 kVA
2.5" dia. x 12" long (63 mm x 305 mm)	1000-30120-FP30	2200° C	30 kVA
3.0" dia. x 6" long (76 mm x 152 mm)	1000-3560-FP20	2650° C	20 kVA
3.0" dia. x 12" long (76 mm x 305 mm)	1000-35120-FP30	2100° C	30 kVA
4.0" dia. x 6" long (102 mm x 152 mm)	1000-4560-FP20	2200° C	20 kVA
4.0" dia. x 12" long (102 mm x 305 mm)	1000-45120-FP30	2000° C	30 kVA
4.0" dia. x 18" long (102 mm x 457 mm)	1000-45180-FP40	2000° C	40 kVA

FEATURES

This specification is for a single zone, high temperature furnace that is capable of operation in dry inert, reducing, and vacuum atmospheres. The basic Model 1000 system includes the graphite furnace, support column and swivel bracket (that permits vertical or horizontal furnace operation), manual power supply, and water-cooled flexible power leads. The operational specifications for these systems are as follows.

HOT ZONE

High-density graphite resistance element.

INSULATION (Thermal)

High-purity graphite felt retained by a solid-wall graphite tube.

FURNACE CONSTRUCTION

The furnace shell is heavy-wall, seamless extruded 6061 T6 aluminum with an anodized interior and exterior. The bulkheads are hard-anodized aluminum and the doors are nickel-plated copper. The shell and bulkheads have integral water-cooling passages. External surface temperatures are maintained at 65° C or less. O-ring seals are Viton.

The furnace has four radial and two axial threaded ports. One radial port is equipped with a 16 mm (.62") diameter viewing port with an anti-fog gas diffuser. All other ports are plugged but will accept the addition of optional sight windows, thermocouples, feedthroughs, and valved adapters.

Power connections are at one end of the furnace through radially mounted, water-cooled copper feedthroughs, providing unimpeded access to the bulkheads and doors. Electrical connection between the feedthroughs and the element is made by simple clamp connections.

The hot zone has straight-through access for convenient loading from either end. Sight hearths in both ends of the furnace serve as thermal baffles and in the vertical position will support the work. A graphite tray is optionally available for attachment to either hearth to support work with the furnace in a horizontal position.

OPERATING ATMOSPHERES

Operating environments are inert and dry reducing atmospheres with pressure capabilities to 15 psig positive (103 kPa) and full vacuum. Operating vacuums in the 10^{-3} torr range (0.13 Pa) at temperatures to 2000° C and in the 10^{-1} torr range (13 Pa) at 2300° C can be achieved.

OPERATING ATMOSPHERES

The addition of optional muffle tube assemblies permits working in oxidizing or wet reducing atmospheres compatible with aluminum oxide. Temperatures to 1800° C can be maintained with the furnace in the vertical position and to 1600° C in the horizontal position.

MAXIMUM TEMPERATURE

Temperatures to 2900° C may be achieved dependent upon the furnace model. All maximum temperatures listed can be maintained in helium gas under ideal conditions. Typically, a furnace should be selected having a maximum temperature rating 200° C higher than will be required for the maximum sustained operating temperature. This allows for heating element aging and other factors. Heating element life may be shortened at operating temperatures exceeding 2750° C.

TEMPERATURE UNIFORMITY

At 1750° C a 2-inch (50 mm) long uniform temperature zone with a uniformity tolerance of $\pm 3^{\circ}$ C is possible in all models. A uniformity tolerance of $\pm 8^{\circ}$ C is possible over 4 inches (100 mm). Uniformities will improve above 2000° C due to the high thermal radiation flux. Full length, very uniform hot zones can be provided for specific operating conditions upon special order.

TEMPERATURE AND OPERATING ATMOSPHERE

Argon or helium are satisfactory as inert operating gases. Helium is acceptable for use up to 3000° C. Since helium is a better thermal conductor than argon or nitrogen greater heat losses will occur when using helium. This means that more power must

be used with helium to achieve a given temperature than with argon or nitrogen. Argon should not be used above 2100° C because of its potential to ionize and sometimes ionization can start as low as 1700° C. The use of dry nitrogen as an inert gas is generally acceptable to 1700° C, when properly vented, nitrogen may be used to 2550° C. The furnace is compatible with dry reducing gases to 2500° C.

CYCLE TIME

Heat-up time from ambient to maximum temperature is usually 30 minutes or less. Power-off cooling time from maximum to 100° C is 2 to 3 hours. More rapid cooling can be achieved by increasing gas flow into the furnace chamber or adding the optional cooling chamber accessory.

POWER SUPPLY

The power supply consists of an SCR power regulator and step-down load transformer.

Power is activated with an on/off switch that controls a furnace power contactor. A panel meter indicates secondary voltage and current. A safety interlock with warning lamp, audible alarm, and operate/reset switch monitors cooling water flow and optional alarm circuits.

Power is manually adjustable from 0-100% by means of a panel-mounted, digi-dial on a 10-turn potentiometer. Power supply components are housed in a floor console that shares a common 25" by 44" base with the furnace support column.

FACILITY REQUIREMENTS

Electric: 208/240 volt, 60 hertz, single phase (or 220 volt, 50 hertz, single phase), 20 kVA.

Water: 2.5 gpm at 50 psig; 65-85° F (9.1 l/min. at 345 kPa; 18-30° C). The water should be filtered if it contains sand or other solid matter.

Operating Gas: 0.2 to 2.0 SCFH (0.1 to 1.0 l/min.). The graphite furnace requires a protective vacuum, or dry inert or reducing atmosphere during operation.

Vacuum: A mechanical vacuum purge pump is recommended for evacuating the furnace prior to process atmosphere backfill.

Space: Maximum floor area: 5' x 5' (1.3 m x 1.3 m) including access. Height: 7' (2.1 m).

Installation: Systems are complete and require only connection to user supplied sources of power, cooling water, and operating gas/vacuum.

MAINTENANCE

A graphite shield retains the insulation permitting clean and easy replacement of the heating element. The long-life graphite element can be replaced in 10 minutes or less without special tools.

GROUP 1000 – ACCESSORIES AND OPTIONS

TEMPERATURE SENSORS

Type C thermocouple with a tungsten-coated molybdenum sheath. For use up to 2000° C.

Optical pyrometers are recommended for use at temperatures above the thermocouple range and are effective from room temperature to 3000° C with controlled atmosphere conditions.

AUTOMATIC TEMPERATURE CONTROL

Automatic temperature control may be achieved with a versatile, high stability, precision PID, setpoint programming controller. Different models with a variety of features are available. These features include self-tuning, multiple stored programs with multiple ramp/dwell segments, and event outputs. Digital serial communications via EIA 232/422/485 are available.

TEMPERATURE RECORDING

Recorders are available in single and multi-pen and single and multi-point models in several chart widths and speeds.

VACUUM PUMPING SYSTEMS

Mechanically, diffusion, and turbo pumped vacuum systems with valved connections and vacuum gauge monitors are available for purging or vacuum atmosphere operation.

GAS CONTROL SYSTEMS

Inert gas controls, burnoff systems for combustible gases, and the Model GSS-97 hydrogen gas safety system are available for controlled atmosphere operation.

HEARTH ELEVATOR

A hearth elevator is available to facilitate bottom furnace loading. An elevator attached to the furnace permits smooth raising and lowering of the furnace bottom door and work support hearth.

QUENCH AND COOLING CHAMBERS

Liquid quench and gas-cooling chambers are optionally available for use with all Group 1000 models.

MUFFLE TUBE

Aluminum oxide muffle tube assemblies can be installed to permit working in air or oxidizing atmospheres at temperatures compatible with aluminum oxide (1800° C maximum).

This accessory is also useful with an atmosphere not compatible with graphite or when the work must be maintained in a very clean or wet reducing environment.

SUPPORT TRAY

Graphite trays for each model size provide work support with the furnace in a horizontal position. The tray bolts to either end hearth and maintains axial view or instrumentation access through its attachment.

CONVERTIBLE INTERIORS

Any standard Model 1000 can be converted, changing the element ID, to any other model size at a later time by replacing the graphite interior, and depending upon the model, the end covers.

INSTRUMENTATION ACCESS

Many sizes of quick-connect probe feedthroughs are available to fit any furnace port for instrumentation. Windows can be added to any port for viewing the hot zone interior. Additional radial ports can be optionally added to the standard furnace.

SPECIAL ACCESSORIES

- Thermal gradient heating elements
- Black body radiation cavity (for 2560 and 3060 models).
- Drop calorimeter
- Muffle tube accessories with large axial view access
- Zirconia muffle tubes
- Other custom-designed accessories

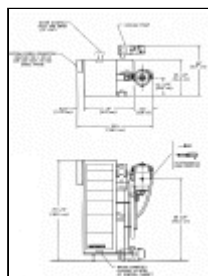
SPECIAL MODIFICATIONS

Additional radial view ports including dual opposed windows for optical extensometer work and long, slot-shaped, through-view access.

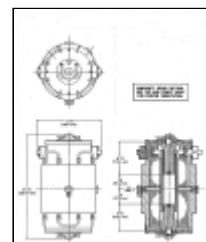
Stainless steel and nickel-plated copper vessel construction for corrosive gas use including hydrogen fluoride and chlorine.

High-pressure construction to ASME standards for pressure vessels.

Special models are available with hot zone lengths to 36 inches (914 mm). Larger diameter models with stainless steel shells are also available.



System Assembly
Typical Model 1000



Furnace Assembly
Model 1000A

Labmaster Group 1000 with Diffusion Pumped
Vacuum System



Click photo to view
larger image

[Home](#) | [Welcome](#) | [Company Profile](#)
[astroDivision](#) | [brewDivision](#) | [europeDivision](#) | [light alloyDivision](#)

[Products](#)

[Contact Us](#) | [Request Information](#) | [Employees](#)
[Press Releases](#) | [Search](#) | [Site Index](#)

Copyright © 1996-2000 Thermal Technology Inc.
Website Designed by [WebNet Express](#)
All Rights Reserved