TGA THERMAX 500 high pressure

Thermo Fisher Scientific, Process Instruments, Newington, USA

The TGA THERMAX 500 Pressure Thermogravimetric Experimental Station measures and records weight changes over a wide dynamic temperature range and at a wide range of pressures in controlled gas environments. The temperature can be programmed to follow a precise temperature profile of ramp and/or isotherm segments with storage capacity of at least 100 methods on the hard disk. Weight and temperature measurements are made at user's specified time intervals and all three are stored on the hard disk of the computer. The time, temperature, and weight data file may be processed by the data analysis program or exported to spreadsheet programs. The data may be viewed on the computer monitor, plotted with a windows compatible printer, printed in tabular form and stored on a separate floppy disk.

The pressure vessel is designed to operate in vacuum to 10^{-4} torr and over a wide range of pressures. At normal ambient temperatures, it can operate at 1500 psi. At 1000 °C, it can operate at 1000 psi. The vessel is machined from solid 316 stainless steel. The vessel has been constructed and inspected in accordance to A.S.M.E. Boiler and Pressure Codes. The acceptance stamps are placed on every TGA THERMAX 500. Black anodized spacers minimize dead volume in the balance chamber to approximately 150 ml. Six spare electrical connectors are available for the user in the electrical feedthrough.

The four sections of the TGA THERMAX 500 (see Figure 1) are the Main Frame, the Console, the Pressure/Flow Controller, and Computer System. The Main Frame consists of the Pressure Balance, the furnace, the support stand and elevator. The console contains the electronics and a visual weight and temperature display. The Computer System consists of a keyboard, CPU, Monitor and windows compatible printer/plotter.

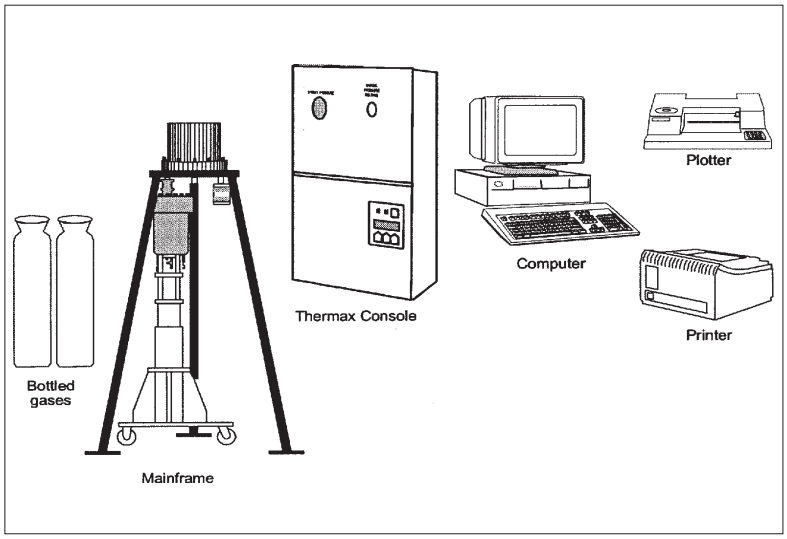

Figure 1: Four sections of the TG-2151

Pressure balance

The Thermo Scientific Pressure Balance consists of two parts: a D-110 Recording Microbalance and a pressure head. Typical specifications for the balance include a sensitivity of 100 micrograms, capacity up to 100 grams and a dynamic range of 1,000,000:1. Though the balance has a sensitivity of 100 micrograms, the high-pressure and high-temperature conditions limit the effective sensitivity depending on the conditions.

Since this is a null balance, the sample always remains in the constant temperature zone of the furnace. The weight from the balance is displayed on the console front panel and on the Computer monitor.

Furnace vessel

The furnace vessel will operate to 1500 psi at ambient temperature. At atmospheric pressure, the furnace will operate to 1100 °C. At 1000 psi, the furnace will operate to 1000 °C. The furnace vessel will operate simultaneously at a wide choice of pressures and temperatures as long as they do not exceed the above limits.

Pressure

The TGA THERMAX 500 consists of three gas chambers, the reactor chamber, balance chamber and the furnace chamber, as shown in figure 2. Fillers in the balance chamber are used to reduce dead volume, which reduces the time delays associated with high-pressure changes.

The furnace chamber is separated from the reactor chamber by a quartz tube. The reactor chamber will permit one psi differential pressure over the furnace chamber.

A specially designed computer interfaced gas pressure/flow controller system for the Thermo Scientific TGA THERMAX 500 is included as part of the pressure TGA. The controller with its built-in mass flow control will maintain the flow rates of the three gases, Furnace Air, Reaction Gas, and Purge Gas, between 100 ml/min. and 5 l/min. An indicator on the front of the controller displays the pressure in the vessel, which can be controlled from 10 psi to 1500 psi with an accuracy of 1 psi.

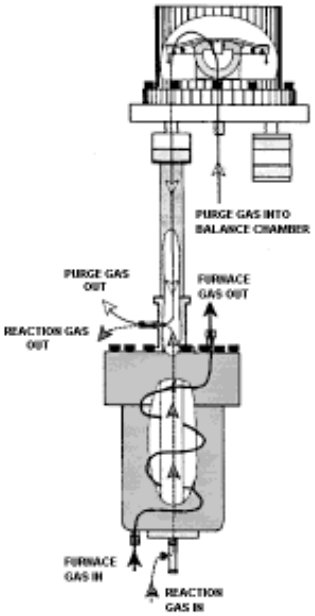

Figure 2: Chambers of the TG-2151

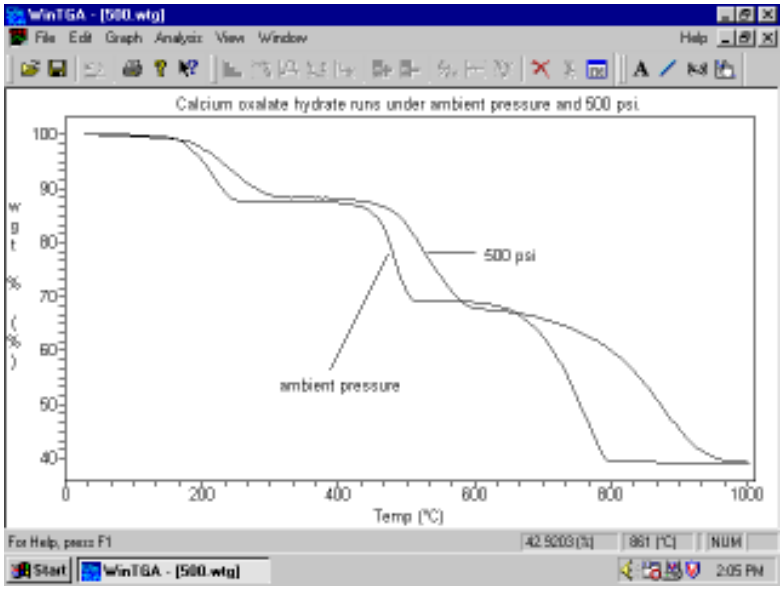

Figure 3: TGA software

Thermo Scientific TGA THERMAX 500 specifications

Balance

Capacity	
Weight	100 g
Volume	20 cc
Weighing Range	
Maximum weight	10 g
Sensitivity	100 µg
Temperature Drift	10 µg/°C
Accuracy at ambient pressure	<0.02%
Repeatability	<0.001%

Furnace

Temperature Range	
At ambient pressure	up to 1100 °C
At 1000 psi	up to 1000 °C
Heating rate, maximum	25 °C/min
Temperature repeatability	± 3 °C

Pressure Level

Maximum pressure at 25 °C	1500 psi
Maximum pressure at 1000 °C	1000 psi
Vacuum	10^{-4} torr
Internal Volume	0.3 liters
Total Pressurized Volume	0.9 liters
Thermocouple	1/8" Chromel-Alumel

Atmospheres*
Static or dynamic gases including H_2O
Alcohol, adelhyde, ketones, alkanes,
Dilute acids, H_2S, SO_2, H_2, CO, CO_2.

NOTE: With condensable gases, special procedures are required. Precaution and extra care are needed for using corrosive gases.

TGA software for complete control

Thermo Scientific TGA systems are controlled with one PC from which you can monitor realtime weight and temperature displays. Menu driven, it's easy to use and the TGA Windows™ NT software provides unparalleled flexibility with features that allow you to:

- Program as many ramps and isothermal segments you wish in one run.
- Store as many methods as needed- the software has no limits.
- Run continuously for as long as there is free hard disk space.
- Modify a method during a run or „on the fly."

The Pressure TGA System allows users to enhance or speed up reactions or shift pressure sensitive variables to higher temperatures. The above traces of Calcium Oxalate run under identical conditions show the effect of ambient pressure versus 500 psi (35 bar) pressure.

Thermo Fisher Scientific Process Instruments

International/Germany
Dieselstr. 4,
76227 Karlsruhe
Tel. +49(0)721 40 94-444
info.mc.de@thermofisher.com

Benelux
Tel. +31 (0) 76 5 87 98 88
info.mc.nl@thermofisher.com

China
Tel. +86 (21) 68 65 45 88
info.mc.china@thermofisher.com

France
Tel. +33 (0) 1 60 92 48 00
info.mc.fr@thermofisher.com

India
Tel. +91 (22) 27 78 11 06
info.mc.in@thermofisher.com

United Kingdom
Tel. +44 (0) 1785 81 36 48
info.mc.uk@thermofisher.com

USA
Tel. 603 436 9444
info.mc.us@thermofisher.com

www.thermo.com/mc

C209_18.08.2008

© 2007/08 Thermo Fisher Scientific · All rights reserved · This document is for informational purposes only and is subject to change without notice.