

Study the Effects of Temperature in ONE Firing !!!



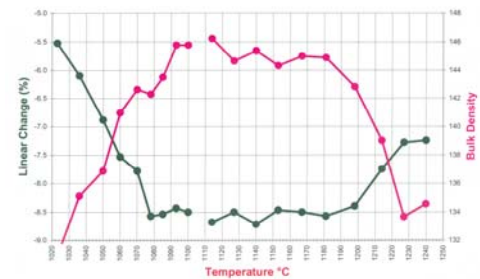
Model GTF-MD-16 Gradient Furnace

The Orton Gradient Furnace fires a series of samples at different KNOWN temperatures in ONE heating chamber in ONE firing. Each sample is measured to study the effects of temperature on the ceramic properties of interest. This technique is ideal for R&D studies and QC comparisons against known standards.



Place an extruded column of a green ceramic, a row of pressed discs or parts, a trough of granular raw material, or a glazed substrate on the D-tube hearth and into the Orton Gradient Furnace. Set the controller for a specific thermal cycle, then manually or automatically record the temperatures of the thermal gradient during the firing.

After the furnace cools, remove the samples and record their position on the D-tube hearth. Since one end of the row of materials was cooler than the other, you can immediately see how the range of firing temperatures affected the shrinkage, color, porosity, particle size, degree of vitrification, and other ceramic properties that are temperature dependent. You can measure the properties of the samples and plot their value versus temperature, as shown in the graph at the right.

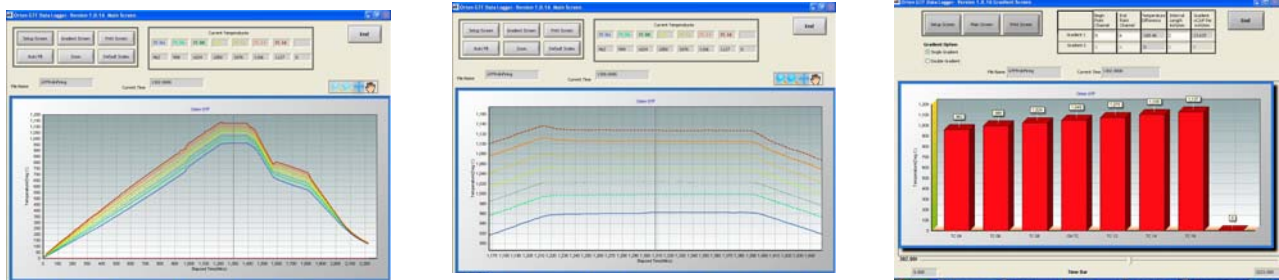


The Orton Gradient Furnace is a specially designed horizontal tube furnace with thermocouples at 2 inch spacings along the 12 inch monitored zone. Samples are placed on the D-tube hearth directly underneath the monitoring thermocouples so the thermal conditions for each sample are known.

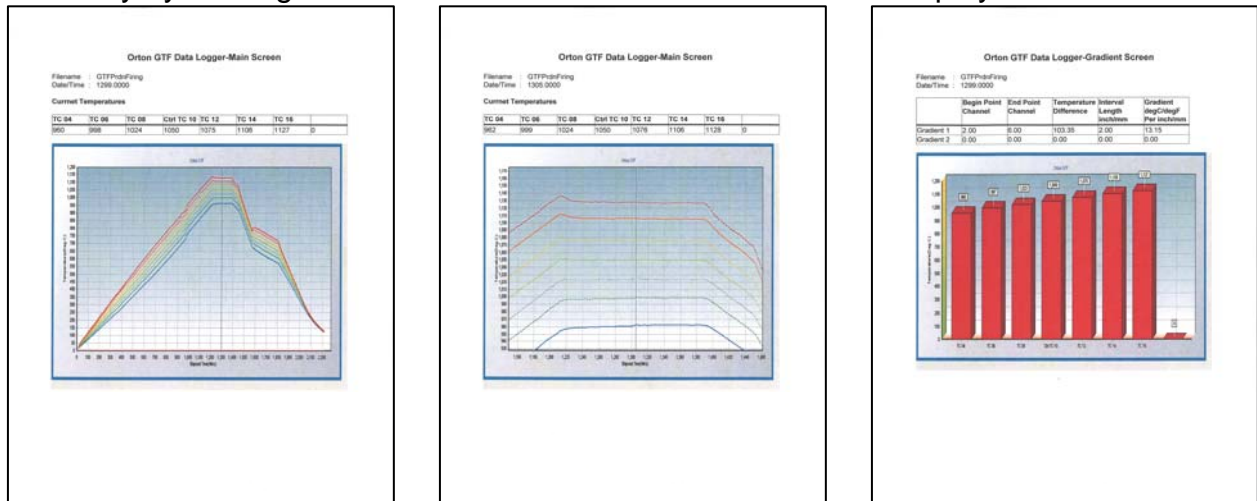
Gradient Furnace Data Logging Option

The Orton Gradient Furnace Data Logging Option – automatically collects the temperature output of the monitoring thermocouples, displays them on the PC monitor in real time, saves all the data in a text file on the PC hard drive, and displays them for post firing analysis.

The three figures below show the PC display during or after a run. The figure at the left shows the data from the entire firing on the main screen, the middle figure shows a zoomed in view of the soak period, and the right figure shows the gradient screen at a selected time during the soak period. The gradient screen also automatically calculated the average gradient across the monitoring thermocouples at the selected time point.



The three figures below are the reports of the screen displays above that are generated automatically by clicking the Print Screen button on the PC screen display.

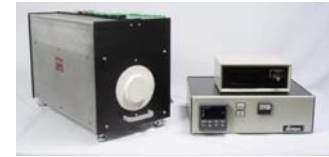


The Orton Gradient Furnace Data Logging Option is comprised of an interface cabinet and the special Orton software. The software requires a PC using the English version of Windows XP or vista.

The Orton Gradient Furnace Data Logging Option can be supplied with the original Gradient Furnace, or can be added to existing Orton Gradient furnaces later.



Orton Model GTF-MD-16 Gradient Furnace



stepdown transformer not shown

Observe, measure, or study the effects of temperature over a temperature span in **ONE** firing. The Orton Model GTF-MD-16 is a specially system with a known, reproducible, approximately linear thermal gradient across a 12" or 16" long monitored zone. The standard soak gradient at 1,600°C is approximately 10°C/inch (approx. 20°C/inch is available). Each system is composed of four main components:

1) The furnace is a rectangular, metal shell structure that houses the refractory fiber insulation and four molybdenum disilicide heating elements that surround one end of the 2.875" ID ceramic heating chamber tube. The samples to be fired are placed on the top of the 2.5" wide high alumina D-tube hearth, which rests on the bottom of the ceramic heating chamber tube. Type "S" thermocouples are spaced on 2" centers along the monitored zone and extend vertically through the top of the heating chamber tube. The concept drawing at the right shows the relative position of the sample and the monitoring thermocouples along with a conceptual thermal gradient. Two specially shaped IFB end plugs are included to cover both ends of the furnace.

2) The furnace temperature is controlled by the Universal Temperature Control Console (UTC). The UTC is connected to the main power source and meters the power to the heating elements. The UTC contains the user programmable, multi-segment PID controller, the phase-angle-fired SCR solid state power module, ammeter, ON/OFF power switch, and appropriate electrical receptacles. The PID controller uses the thermocouple at the hot end of the furnace for control, so the monitored gradient falls from this control temperature.

3) Electrical power from the UTC runs through the included step-down transformer (not shown in the photographs) and on to the molybdenum disilicide heating elements.

4) The Temperature Display Cabinet contains a digital panel display, rotary selector switch, and appropriate electrical receptacles to display the temperatures of the other thermocouples along the length of the monitored zone. The user manually records the temperatures of the monitoring thermocouples as a function of time.

Real Time Data Logging Option - An optional computer interface can be added to display the temperatures of all the monitoring thermocouples on the user provided PC during the run, and save that data for post firing analysis.

The GTF-MD-16 system requires 240 VAC, 30 amp, 50 or 60 hertz input power. The Temperature Display Cabinet requires 120 VAC, 5-amp power. Please advise the local power supply so Orton can adjust the power control system to suit the local condition.

Model GTF-16 Gradient Furnace System Typical Specifications

	<u>GTF-MD-16</u>	<u>GTF-MD-16L</u>	<u>Power Requirements:</u>		
Maximum Temperature	1,600°C	1,600°C	UTC	240 VAC, 30 Amps, 50/60 hertz	
Heating Chamber Tube	High Alumina	High Alumina	Temperature Display Cabinet	120 VAC, 0.5 Amps, 50/60 hertz	
Monitored Zone Length	12"	16"	<u>Approximate Dimensions & Weight</u>		
Monitoring T/C's (Type "S")	6	8	<u>Dimensions</u>	<u>Weight</u>	
Control T/C (Type "S")	1	1	GTF-MD-16 Furnace	25" long x 15" W x 18" T	70 pounds
D-tube Hearth Length"	17"	23"	GTF-MD-16L Furnace	32" long x 15" W x 18" T	85 pounds
<u>APPROXIMATE Gradient in the Monitored Zone (after reaching equilibrium at 1,600°C)</u>			UTC Console	17" W x 14" D x 5.5" T	17 pounds
Average °C/inch (± 2°C/inch)	10°C/inch	10°C/inch	Step-down Transformer	15" long x 9" W x 10" T	68 pounds
Approximate Temperature Span	120°C	160°C	Temperature Display Cabinet	10" W x 8" D x 4.5" T	5 pounds
Note: gradient increases slightly as the equilibrium temperature decreases					