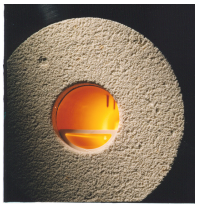
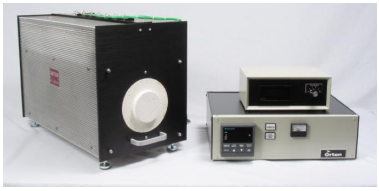
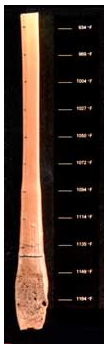
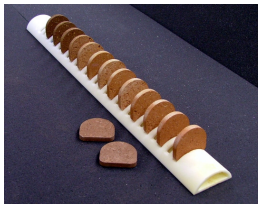


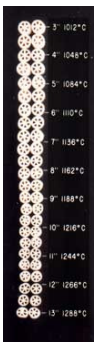
Study the Effects of Temperature in ONE Firing !!!

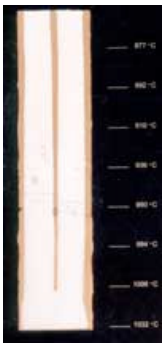
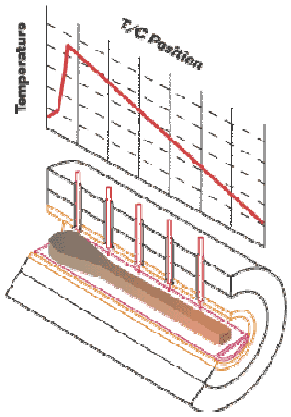


Model GTF-MD-16 Gradient Furnace

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.

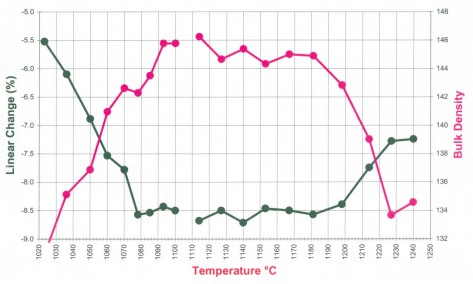





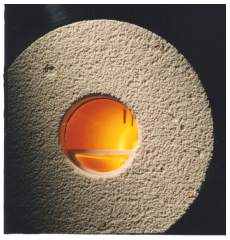
Place an extruded column of a green ceramic, a row of pressed discs or parts, a trough of granular raw material, or a glazed substrate on the D-tube hearth and into the Orton Gradient Furnace. Set the controller for a specific thermal cycle, then manually or automatically record the temperatures of the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

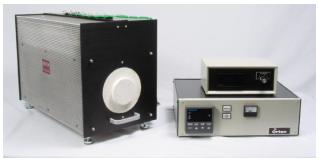


The Orton Gradient Furnace is a specially designed horizontal tube furnace with thermocouples at 2 inch spacings along the 12 inch monitored zone. Samples are placed on the D-tube hearth directly underneath the monitoring thermocouples so the thermal conditions for each sample are known.

The Edward Orton Jr. Ceramic Foundation · 6991 Old 3C Highway · Westerville, OH 43082 USA
Web Site: www.OrtonCeramic.com · Phone: (614) 818-1331 · Fax: (614) 895-5610 · E-mail: info@OrtonCeramic.com



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, ½ 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

	GTF-MD-1612	GTF-MD-1616
Maximum Temperature	1,600°C	1,600°C
Heating Chamber Tube	High Alumina	High Alumina
Monitored Zone Length	12"	16"
Monitoring T/C's (Type "S")	6	8
Control T/C (Type "S")	1	1
D-tube Hearth Length"	17"	23"

APPROXIMATE Gradient in the Monitored Zone (after reaching equilibrium at 1,600°C)

Average °C/inch (± 2°C/inch)	10°C/inch	10°C/inch
Approximate Temperature Span	120°C	160°C

Note: gradient increases slightly as the equilibrium temperature decreases

Power Requirements:

UTC	240 VAC, 30 Amps, 50/60 hertz
Temperature Display Cabinet	120 VAC, 0.5 Amps, 50/60 hertz

Approximate Dimensions & Weight	Dimensions	Weight
GTF-MD-1612 Furnace	25" long x 15" W x 18" T	70 pounds
GTF-MD-1616 Furnace	32" long x 15" W x 18" T	85 pounds
UTC Console	17" W x 14" D x 5.5" T	17 pounds
Step-down Transformer	15" long x 9" W x 10" T	68 pounds
Temperature Display Cabinet	10" W x 8" D x 4.5" T	5 pounds