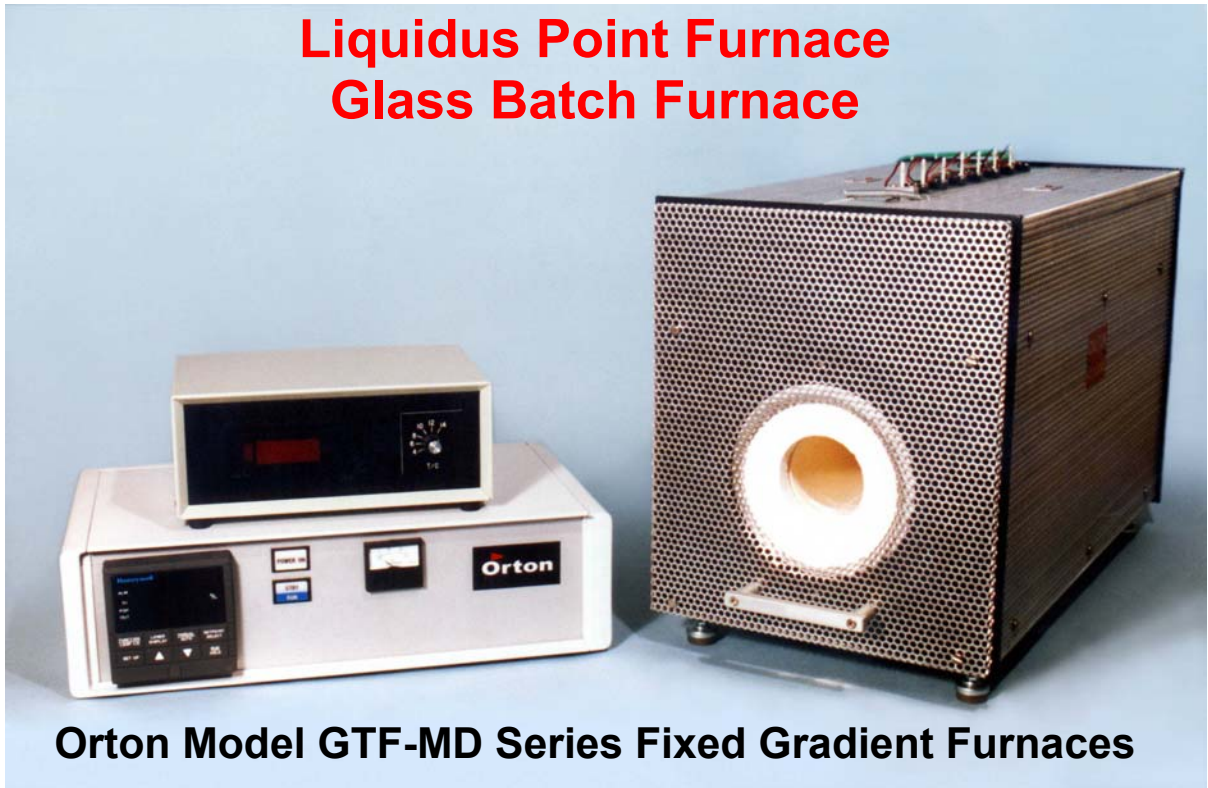


## Liquidus Point Furnace Glass Batch Furnace



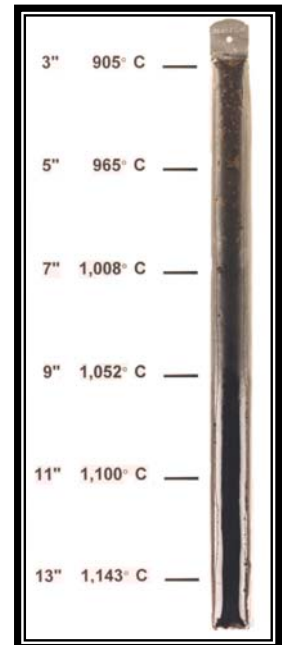
**Orton Model GTF-MD Series Fixed Gradient Furnaces**

### Liquidus Point Determination (suitable for the ASTM C 829 method)

Samples of glass, frit, or cullet are poured into a platinum boat then placed into the hot Orton Gradient Furnace for 1 or 24 hours. The Orton Model GTF-MD-15/16 Series Furnace is a specially designed horizontal tube furnace with a controlled, reproducible, linear thermal gradient of approximately 120°C across a 12" long monitored zone, so the temperature of the glass in the boat corresponds to its position along that 12" zone. The boat is removed hot and allowed to quench cool, freezing the glass in the state it developed inside the furnace. Upon visual, or microscopic inspection, the crystal boundary plane (the Liquidus Point) is located and the temperature of that plane is interpolated from the temperature / position relationship of the known gradient.

### Glass Batch Studies

Samples of the glass batch, or raw materials are poured into one, or several platinum boats, then placed into the Orton Gradient Furnace. The furnace can be hot, or can be programmed for a specific thermal cycle. The Orton Model GTF-MD-15/16-L Series Furnace is a specially designed horizontal tube furnace with a controlled, reproducible, linear thermal gradient of approximately 320°C across a 16" long monitored zone, so the temperature of the glass batch in the boat corresponds to its position along that zone. The sample boat can be removed hot and allowed to quench cool, freezing the batch in the state it developed inside the furnace. Or the boat can cool inside the furnace. Upon visual inspection, the temperature of the zone of interest is interpolated from the temperature / position relationship of the known gradient





### The Orton GTF-MD Series Furnace

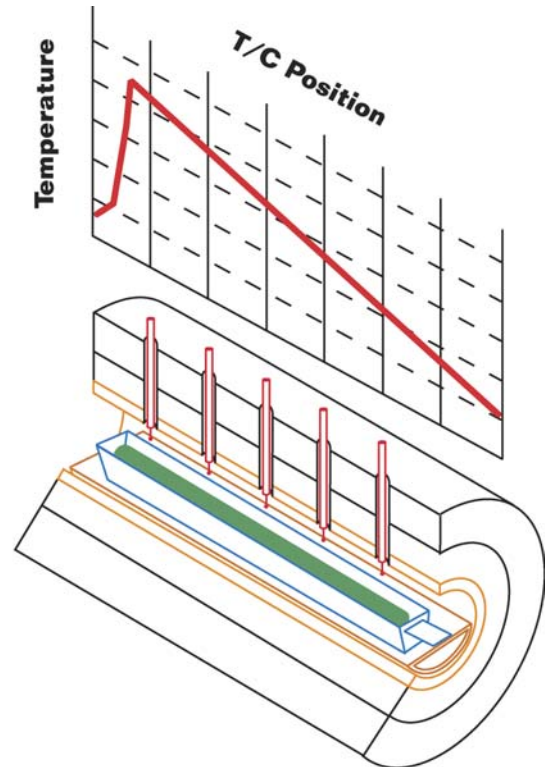
Observe, measure, or study the effects of temperature over a controlled temperature span of 120°C, 160°C, 240°C, or 320°C in **ONE** firing. The Orton GTF-MD Series Furnace is a specially designed horizontal tube furnace with a controlled, reproducible, approximately linear thermal gradient across a 12" or 16" long monitored zone, and 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 3" 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. 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 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 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 system includes all interconnecting cables and instruction manual. The Temperature Display Cabinet requires 120 VAC, 15-amp power. The UTC requires 240 VAC, 20-amp, 50/60 hertz input power.

#### Model GTF-MD Series Specifications

	GTF-MD-15	GTF-MD-15L	GTF-MD-16	GTF-MD-16L
Maximum Temperature	1,500°C	1,500°C	1,600°C	1,600°C
Heating Chamber Tube	Mullite	Mullite	High Alumina	High Alumina
Monitored Zone Length	12"	16"	12"	16"
Monitoring T/C's (Type "S")	6	8	6	8
Control T/C (Type "S")	1	1	1	1
D-tube Hearth Length	17"	21"	17"	21"
<u>Approximate Gradient in the Monitored Zone (Standard Gradient)</u>				
Average °C/inch	10°C/inch	10°C/inch	10°C/inch	10°C/inch
Average Range	120°C	160°C	120°C	160°C
<u>Approximate Gradient in the Monitored Zone (Alternate Gradient)</u>				
Average °C/inch	20°C/inch	20°C/inch	20°C/inch	20°C/inch
Average Range	240°C	320°C	240°C	320°C

<u>Power Requirements:</u>		
UTC	240 VAC, 20 Amps, 50/60 hertz	
Temperature Display Cabinet	120 VAC, 15 Amps, 50/60 hertz	
<u>Approximate Dimensions &amp; Weight</u>		
	<u>Dimensions</u>	<u>Weight</u>
GTF-MD-15/16 Furnace	16" H x 13" W x 25" D	25 pounds
GTF-MD-15L/16L Furnace	16" H x 13" W x 31" D	30 pounds
UTC Console	5" H x 18" W x 11" D	15 pounds
Step-down Transformer	10" H x 10" W x 12" D	65 pounds
Temperature Display Cabinet	5" H x 10" W x 7" D	2 pounds

Descriptions and Specifications are subject to change without notice

23 October 2002