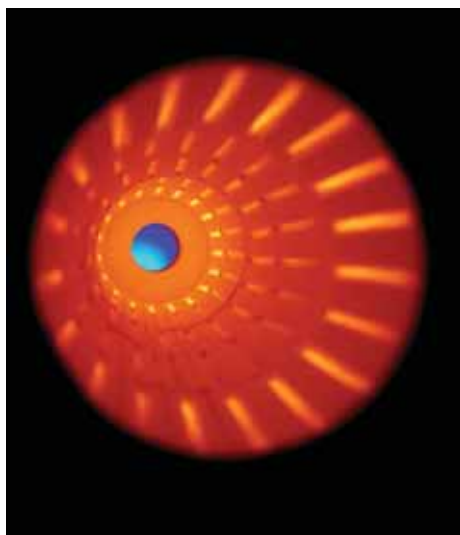


Tube Furnaces

Introduction to Tube Furnaces



Carbolite tube furnaces offer precise temperature control, excellent temperature uniformity and the most cost effective solution for heating small workpieces.

The extensive range of tube furnaces is probably the most comprehensive available from a single source and includes wire heated tube furnaces to 1200°C, silicon carbide heated furnaces to 1600°C and molybdenum disilicide heated furnaces up to 1700°C. Tube furnaces at 1800°C are heated by lanthanum chromite or molybdenum disilicide.

Many processes demand the use of a tube furnace – from simple combustion techniques (ideal for carbon determination and organic analysis) to more sophisticated applications requiring accurate and uniform heating.

Specialist models are incorporated in the range, including vacuum and rotating, rotary reactor furnaces, multi-zone and those specifically designed for the calibration of thermocouples, including three-zone control models.

Typical tube furnace applications include:

- Gas analysis
- Materials research
- Sintering & firing of ceramics
- Crystal growing
- Continuous strip & wire heating
- Doping of silicon wafers
- Powder metallurgy
- Thermocouple calibration
- Thermal degradation
- Superconductor research



As in all areas of our production, custom built models are also available to specifically meet your requirements.

Horizontal tube furnaces are mounted on a base unit, whilst vertical models are supplied with a stand and a separate control box with a length of conduit flex. This permits horizontal, vertical or wall mounted use.

Many tube furnaces combine wire wound heating elements and low thermal mass insulation, whilst the split models and G series models combine free radiating wire elements in vacuum formed insulation modules, which provide good support and increase the working life of the elements.

To achieve the most uniform temperature, both ends of the tube furnace should be fitted with tapered ceramic end plugs or radiation shields.

For the G series models, an integral work tube is not fitted and a separate worktube must be used. However, removable tube adaptors at each end of the furnace allow rapid changes for different size worktubes.

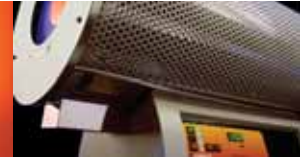
Vertically loaded tube furnaces need careful design of the sample support system and effective tube end insulation to prevent heat losses and convection air currents. Please discuss your application with us.

All models use the latest PID microprocessor digital control systems. Stepped and controlled heating and cooling can be achieved with the use of a programmer, which also ensures the possibility of thermal shock is minimised.

Care should be taken to avoid steep temperature gradients and thermal stresses, which could crack a ceramic tube. Please check the recommended heating rates. It is advisable to either pre-heat the sample before loading or heat the sample and furnace simultaneously. Carbolite, in common with other tube furnace manufacturers, does not accept responsibility for tube failures resulting from loading cold crucibles/samples into hot ceramic tubes.

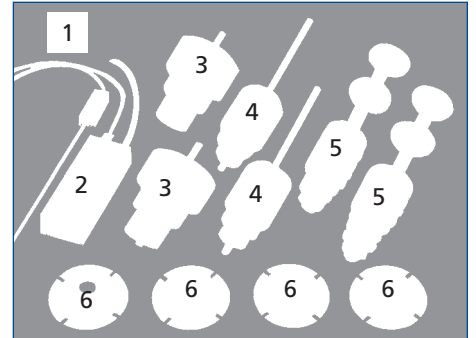
For precise sample temperature monitoring, a digital temperature indicator can be built into the furnace for use with a probe thermocouple, which is inserted into the worktube to measure the temperature close to the workpiece.

A double skin construction or an outer mesh guard promotes natural air-cooling and protects the operator from hot surfaces. In the event of thermocouple malfunction, the control system automatically cuts power to the heating elements.



A wide range of optional accessories includes:

- selection of worktubes including:
 - impervious aluminous porcelain (IAP)
 - mullite
 - recrystallised alumina (RCA)
 - metallic (APM)
 - sillimanite
 - silica
- ceramic insulation plugs
- radiation shields (for use with vacuum)
- worktube seals for vacuum/controlled atmosphere applications
- gas flowmeters
- gas safety systems
- probe thermocouple for calibration and accurate measurement of workpiece temperature
- multi-segment programmers
- remote PC control and software for data logging
- overtemperature protection
- chart recorder
- calibration certificates
- wall mounting brackets
- 'L' stand allowing vertical and/or horizontal operation
- separate control boxes

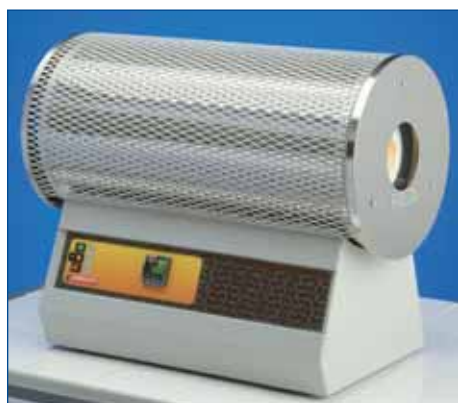


1. Probe Thermocouple
2. Temperature Indicator
3. Type C Insulation Plugs for heating in air
4. Type D Insulation Plugs for heating in controlled atmosphere
5. Radiation Shields for vacuum use
6. Worktube End Flanges

Safety:

Ceramics can become slightly electrically conductive at high temperatures and therefore tube furnaces should be switched off before loading and unloading.

Wire Wound Tube Furnaces to 1200°C



CTF 12/65/550



MTF 12/38/250/3216
& MTF 10/25/130/301

The majority of these models utilise a resistance wire heating element, which is wound around the outside of a ceramic worktube making it an integral part of the heating element. If the tube is required to contain an atmosphere or is likely to be contaminated by spillage, an additional work tube should be used. The thermocouple is located in a protected position between the outside of the work tube and the heating element, allowing the full work tube diameter to be used and protects the thermocouple from mechanical damage.

Wire Wound Tube Furnaces ~ Single Zone	CTF 12/65/550	CTF 12/75/700	CTF 12/100/900
Max. Temperature (°C)	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100
Heat up time (mins)	45	45	90
Inside Diameter of Fixed Element Tube (mm)	65	75	100
Heated length (mm)	550	700	900
Overall Furnace length (mm)	600	750	950
Horizontal Mounting on Control Box	✓	✓	✓
Option of mounting: L stand / Wall bracket			
Blank base / Separated base	✓	✓	✓
Uniform length +/-5 (°C)	230	265	640
Thermocouple Type	N	N	N
Max. Power (W)	2000	3000	4500
Holding Power Requirement (W)	600	800	1000
External Dimensions :			
H (mm)	525	525	525
W (mm)	625	775	975
D (mm)	360	360	360
Weight (kg)	25	28	35

Wire Wound Tube Furnaces ~Single Zone	MTF 9/15/ 130	MTF 10/15/ 130	MTF 10/25/ 130	MTF 12/25/ 250	MTF 12/38/ 250	MTF 12/25/ 400	MTF 12/38/ 400	MTF 12/38/ 850
Max. Temperature (°C)	900	1000	1000	1200	1200	1200	1200	1200
Continuous Temperature (°C)	800	900	900	1100	1100	1100	1100	1100
Heat up time (mins)	7	5	10	15	25	30	25	-
Inside diameter of fixed element tube (mm)	15	15	25	25	38	25	38	38
Heated Length (mm)	130	130	130	250	250	400	400	850
Overall furnace Length (or width) (mm)	180	150	150	300	300	450	450	900
Horizontal Mounting on control box	✓	✓	✓	✓	✓	✓	✓	✓
Option of mounting: L stand / Wall bracket / Blank base / Separated base	8	3	3	3	3	3	3	-
Uniform length +/-5 (°C)	30	30	45	60	90	100	130	-
Thermocouple Type	K	K	K	N	N	N	N	-
Max. Power (W)	220	400	400	700	1000	1000	1500	2800
Holding Power (W)	100	100	100	200	300	200	300	-
External Dimensions:								
H (mm)	180	265	265	375	375	430	430	-
W (mm)	90	150	150	370	450	370	450	-
D (mm)	180	175	175	375	375	375	375	-
Weight (kg)	2	3	3	10	15	10	15	-



1200°C G range Tube Furnaces

These furnaces can accept worktubes with an outside diameter from 20 – 170mm. The range includes seven heated lengths from 300mm to 1200mm in both horizontal and vertical versions, with either single-zone or three-zone control. The multi-zone models can provide particularly good temperature uniformity.

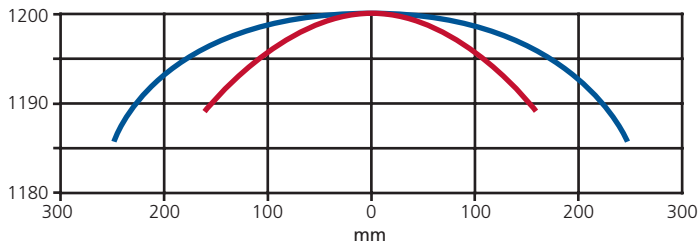
Heating is provided by semi-embedded, free-radiating wire elements in vacuum formed insulation modules, which provide good support and increase the working life of the element. An integral worktube is not fitted and a separate worktube must be used, but removable tube adaptors at each end of the furnace allow rapid changes for different size worktubes.

The horizontal versions are mounted on an attractive base unit, whilst the versatile models are supplied with a stand kit and a separate control box with a length of conduit flex which permits horizontal, vertical and wall mounted use. (see page 30 for more details)



GHA 12/75/600/301

°C Uniformity profiles



GHC 12/80/450 ±5°C over 300mm GHA 12/80/600 ±5°C over 440mm

Horizontal Tube Furnaces	GHA 12/300	GHA 12/450	GHA 12/600	GHA 12/750	GHA 12/900	GHA 12/1050	GHA 12/1200
Max. Temperature (°C)	1200	1200	1200	1200	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100	1100	1100	1100	1100
Heat up time (mins)	90	75	~	~	~	100	~
Maximum o/d of Separate Worktube (to hold sample) (min 20mm)	170	170	170	170	170	170	170
Worktube length:							
heating in air (mm)	500	650	800	950	1100	1250	1400
heating with Atmosphere (mm)	900	1050	1200	1350	1500	1650	1800
Heated Length (mm)	300	450	600	750	900	1050	1200
Overall Furnace length (mm)	480	630	780	930	1080	1230	1380
Horizontal Mounting on Control Box	✓	✓	✓	✓	✓	✓	✓
Thermocouple Type	N	N	N	N	N	N	N
Max Power (W)	2300	3100	3900	4600	5400	6200	7000
Holding Power (W)	~	~	~	~	~	~	~
External Dimensions:							
H (mm)	670	670	670	670	670	670	670
W (mm)	526	676	826	976	1126	1276	1426
D (mm)	468	468	468	468	468	468	468
Weight (kg)	~	36.5	40	51	55	~	~

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) Heat up time is measured at 100°C below max. temperature with an empty tube.



Showing versatile stand for vertical and/or horizontal use



Showing wall mounting brackets

GVA models

The GVA range of vertical tube furnaces have a maximum operating temperature of 1200°C and a tube diameter ranging from 19.5 to 150mm id. An integral worktube is not fitted as standard, but is needed and therefore a worktube must be ordered separately.

Heating is provided by resistance wire heating elements, semi-embedded in rigidised vacuum formed low thermal mass insulation modules, models are available in seven heated lengths from 300 - 1200mm. These elements give both long life and rapid heat up times to operating temperature. Removable tube adapters are available that allow rapid changes for different size worktubes if required.

All of our tube furnaces can be adapted to allow a non-oxidising atmosphere or vacuum, if required, by fitting an additional worktube and end seals (see page 44 for details).

This furnace range is supplied with a versatile stand kit, which allows the furnace to be mounted vertically on a stand or wall mounted, or bench mounted horizontally (shown left), all using the separate control box

Applications include testing of novel materials under strict temperature & various atmosphere conditions, testing electronic components and semiconductor materials under inert atmospheres or vacuum, testing of temperature sensors such as thermocouples and PT100's, which may require enhanced thermal uniformity, as well as many other applications requiring rapid accurate heat up with the option for an atmosphere.

Vertical Tube Furnaces	GVA 12/300	GVA 12/450	GVA 12/600	GVA 12/750	GVA 12/900	GVA 12/1050	GVA 12/1200
Max. Temperature (°C)	1200	1200	1200	1200	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100	1100	1100	1100	1100
Maximum o/d of separate worktube (to hold sample) (min 20mm)	170	170	170	170	170	170	170
Separate worktube length required:							
heating in air (mm)	500	650	800	950	1100	1250	1400
heating in atmosphere (mm)	900	1050	1200	1350	1500	1650	1800
Heated length (mm)	300	450	600	750	900	1050	1200
Overall furnace length (mm)	480	630	780	930	1080	1230	1380
Versatile mounting: L stand / Wall bracket	✓	✓	✓	✓	✓	✓	✓
Thermocouple type	N	N	N	N	N	N	N
Max Power (W)	2340	3120	3900	4680	5460	6240	7020
Holding power (W)							
Weight (kg)	~	~	~	50	57	68	~
External Dimensions:							
H (mm)	1345	1418	1418	1793	1860	1943	2018
W (mm)	468	468	468	468	468	468	468
D (mm) Depth includes stand	662	662	662	662	662	662	662
Clearance under furnace:							
min & max (mm)	251-778	177-702	177-550	177-777	100-702	26-627	26-551
V model control box dimensions:							
H x W x D 222 x 570 x 375 (mm)	✓	✓	✓	✓	✓	✓	✓

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) Heat up time is measured at 100°C below max. temperature with an empty tube.

Split Tube Furnaces

These furnaces are manufactured in two halves and are hinged together for easy loading of a worktube reactor vessel, or large workpiece. The design offers the flexibility to place the furnace around a fixed item - such as a pipe with flanges which are too large to pass through a solid tube furnace, or around a sample which is fixed into a materials test rig.

The HST models are ideally suited for horizontal, bench use, whilst the VST models have the same maximum internal diameter, but smaller external dimensions and are primarily designed to fit within test rigs. The VST models can also be mounted on a stand with either near or far hinge,* wall mounted with a bracket.**

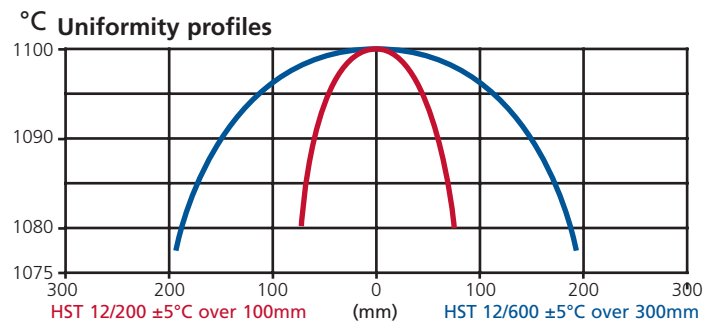
Both models have extended insulation beyond the heated length which provides the opportunity to accept any tube diameter up to 110mm maximum od, by cutting away part of the unheated insulation.

* Far hinges allow much larger openings but take up more room

** Alternatively vertical models can be wall mounted with a bracket



HST 12/70/600



Horizontal Split Tube Furnaces	HST 12/200	HST 12/300	HST 12/400	HST 12/600	HST 12/900
Max. Temperature (°C)	1200	1200	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100	1100	1100
Heat up time (mins)	45	45	45	45	45
Maximum o/d of Separate Worktube (to hold sample) (min 20mm)	110	110	110	110	110
Separate Worktube Length required :					
heating in air (mm)	350	450	550	750	1050
heating with atmosphere	650	750	850	1050	1350
Heated Length (mm)	200	300	400	600	900
Overall Furnace Length (mm)	350	450	550	750	1050
Horizontal Mounting with remote control box	✓	✓	✓	✓	✓
Uniform Length $\pm 5^{\circ}\text{C}$	100	150	200	300	450
Thermocouple Type	N	N	N	N	N
Max. Power (W)	1000	1500	2000	3000	4500
Holding Power (W)	~	~	900	1100	~
External Dimensions:					
H (mm)	350	350	350	350	350
W (mm)	325	425	525	725	1025
D (mm)	410	410	410	410	410
Weight (kg)	26	28	32	38	60
Control Box Dimensions :					
H x W x D 222 x 570 x 375 (mm)	✓	✓	✓	✓	✓

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) All external dimensions are taken with the chamber closed.
- 4) Heat up time is measured at 100°C below max. temperature with an empty tube



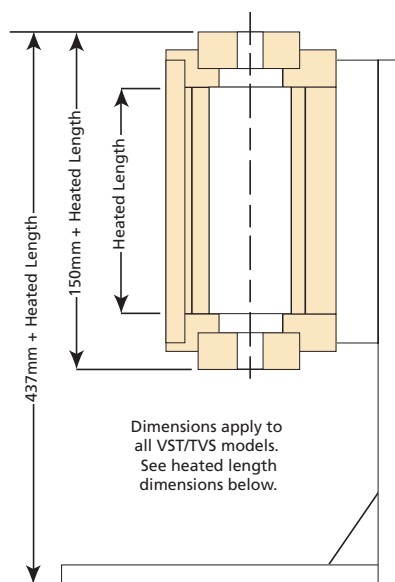
VST 17/250

General Features

Standard vertical hinged tube furnaces are provided with a vertical support stand. Optional far hinge support stand or wall bracket are available if you need a wide opening. (See below)

Wire embedded split tube furnaces ~ single zone	VST 12/200	VST 12/300	VST 12/400	VST 12/600	VST 12/900	VST 17/250
Max. Temperature (°C)	1200	1200	1200	1200	1200	1700
Continuous Temperature (°C)	1100	1100	1100	1100	1100	1600
Heat up time (mins)	45	45	45	45	45	~
Maximum o/d of Separate Worktube (to hold sample) (min 20mm)	110	110	110	110	110	90
Separate Worktube Length required:	500	600	700	900	1200	550
Heating in air (mm)	500	600	700	900	1200	550
Heating with Atmosphere (mm)	800	900	1000	1200	1500	850
Heated Length (mm)	200	300	400	600	900	250
Overall Furnace Length (or width) mm	350	450	550	750	1050	900
Vertical Stand mounted near hinge.						
Optional wall bracket, far hinge, no stand	✓	✓	✓	✓	✓	✓
Thermocouple Type	N	N	N	N	N	B
Max. Power (W)	1000	1500	2000	3000	4500	4500
Holding Power (W)	800	~	900	1100	~	~
External Dimensions:						
H (mm)	300	400	500	700	1000	865
W (mm)	350	350	350	350	350	600
D (mm)	350	350	350	350	350	705
Weight (kg)	24	25	26	32	44	~
Control Box Dimensions :						
H x W x D 222 x 570 x 375 (mm)	✓	✓	✓	✓	✓	~

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) All external dimensions are taken with the chamber closed
- 4) Heat up time is measured at 100°C below max. temperature with an empty tube



VST / TVS Tube Furnace on Standard Support Stand

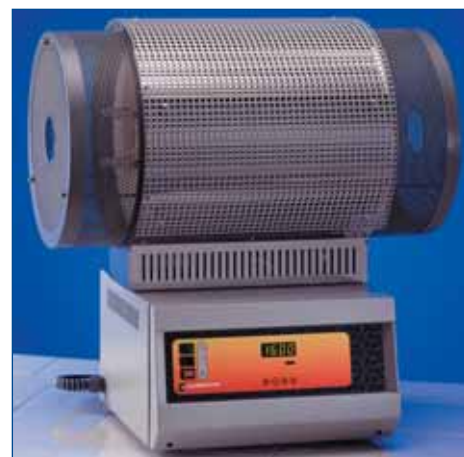


High Temperature Tube Furnaces

The 1500°C and 1600°C tube furnace ranges utilise silicon carbide (SiC) heating elements arranged in a heated chamber surrounding the work tube, and provide even heating of the tube surface for maximum temperature uniformity. SiC furnaces can be mounted for use horizontally or vertically with an optional "L stand" please enquire for details.

High temperature furnaces ~ single zone	STF 15/180	STF 15/450	STF 15/610	STF 16/180	STF 16/450	STF 16/610
Max. Temperature (°C)	1500	1500	1500	1600	1600	1600
Continuous Temperature (°C)	1400	1400	1400	1500	1500	1500
Heat up Time (mins)	heat up rate will vary					
Maximum o/d of Separate Worktube	60	90	90	60	90	90
Inside Diameter of fixed element tube (mm)	~	~	~	~	~	~
Heated Length (mm)	180	450	610	180	450	610
Overall Furnace Length (or width) (mm)	600	900	1200	600	900	1200
Horizontal Mounting on Control Box	✓	✓	✓	✓	✓	✓
Option of Mounting:						
L stand / Wall bracket / Blank base / Separated base	✓	✓	✓	✓	✓	✓
Vertical mounting with remote control box as standard	✗	✗	✗	✗	✗	✗
Uniform Length +/-5 (°C) (a)(d)	80	350	400	80	350	400
Thermocouple Type	R	R	R	R	R	R
Maximum Power Requirement (W)	1500	5500	6000	2500	6000	7000
Holding Power (W)	~	3800	4200	~	4000	4500
External Dimensions:						
H (mm)	500	660	660	500	660	660
W (mm)	600	830	1130	600	830	1130
D (mm)	375	445	445	375	445	445
Weight (kg)	29	34	45	29	40	50

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) Heat up time is measured at 100°C below max. temperature with an empty tube.



STF 15/180/301



STF 15/610/3216P1 with vertical option L stand

tube furnaces

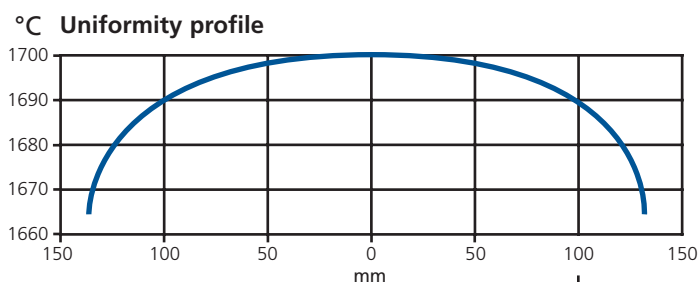


CTF 1700°C and 1800°C tube furnaces use molybdenum disilicide (MoSi_2) heating elements suspended down each side of a horizontal tube. At elevated temperatures these heating elements become very soft and therefore this furnace is only suitable for horizontal use.

PVT 1800°C tube furnaces use lanthanum chromite heating elements, which generally achieve slower heating rates. These furnaces are for use in the vertical position only, and the elements are suspended around a vertical tube. Although the elements give off a small amount of chromium vapour the work tube shields all but the most sensitive work pieces from contamination or pink colouration.

Three zone versions are available which give improved uniform length with three zone control (see pages 35, 36 and 37).

CTF 17/75/300/3216P1



CTF 17/75/300 ±5°C over 205mm
±2°C over 150mm
±1°C over 75mm

High temperature furnaces ~ single zone	CTF 17/300	CTF 17/600	CTF 18/300	CTF 18/600	PVT 18/50 /200	PVT 18/75 /350	PVT 18/100 /350	PVT 18/125 /350
Max. Temperature (°C)	1700	1700	1800	1800	1800	1800	1800	1800
Continuous Temperature (°C)	1600	1600	1700	1700	1700	1700	1700	1700
Heat up time (mins)	heat up rate will vary							
Maximum o/d of separate worktube	90	90	90	90	60	90	115	140
Heated Length (mm)	300	600	300	600	200	350	350	350
Overall Furnace Length (mm)	650	950	650	950	~	~	~	~
Horizontal Mounting on Control Box	✓	✓	✓	✓	✗	✗	✗	✗
Option of Mounting: L stand / Wall Bracket / Blank base / Separated base	✗	✗	✗	✗	✗	✗	✗	✗
Vertical Mounting with Remote Control Box as standard	✗	✗	✗	✗	✓	✓	✓	✓
Uniform length +/-5 (°C)	200	400	200	400	~	~	~	~
Thermocouple Type	B	B	2	2	2	2	2	2
Maximum Power (W)	5500	9000	6000	9300	6000	8000	8000	12000
Holding Power Requirement W	2500	3800	~	~	4000	5000	5000	7000
External Dimensions:								
H (mm)	755	900	755	755	850	1000	1000	1000
W (mm)	600	950	600	900	700	700	700	700
D (mm)	555	630	555	555	810	810	810	810
Weight (kg)	126	220	130	230	270	300	400	500

1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.

2) Uniformity graphs are available on request, for most models.

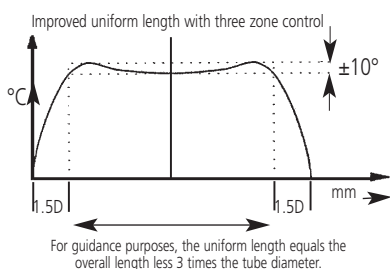
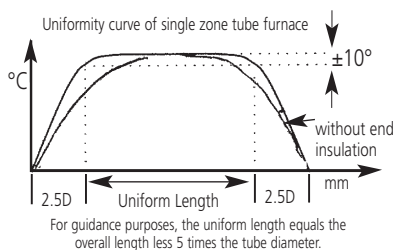
3) Heat up time is measured at 100°C below max. temperature with an empty tube.



Three Zone Tube Furnace

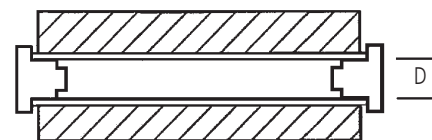
Similar in construction to the CTF and MTF models, the TZF offers excellent temperature uniformity as the heated length is divided into three zones, each with its own temperature controller and thermocouple. The power supplied to the end zones is automatically adjusted to compensate for the heat loss at the ends of the tube irrespective of whether the ends are left open or have insulation plugs fitted. This system provides a longer uniform zone temperature than that achieved by using a single zone furnace of the same length. The three temperature controller thermocouples are linked "back to back" so that they act to keep all three zones at the same temperature.

Uniformity profiles



TZF 12/75/700/3216P1

Tube furnace cross section



Wire wound tube furnaces ~ three zone	TZF12/38/400	TZF12/65/550	TZF12/75/700	TZF12/100/900
Max. Temperature (°C)	1200	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100	1100
Heat up Time (mins)	25	45	45	120
Inside Diameter of fixed element tube (mm)	38	65	75	100
Heated length (mm)	400	550	700	900
Overall Furnace Length (mm)	450	600	750	950
Horizontal Mounting on control box	✓	✓	✓	✓
Option of Mounting: L stand / Wall bracket / Blank base / Separated base	✓	✓	✓	✓
Uniform Length +/-5 (°C)	305	390	540	745
Thermocouple Type	N	N	N	N
Max. Power (W)	1175	1817	2755	4150
Holding Power (W)	700	600	800	1000
External Dimensions:				
H (mm)	430	525	525	525
W (mm)	450	625	775	975
D (mm)	375	360	360	360
Weight (kg)	18	30	32	4

1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber

2) Uniformity graphs are available on request, for most models.

3) Heat up time is measured at 100°C below max. temperature with an empty tube.

tube furnaces

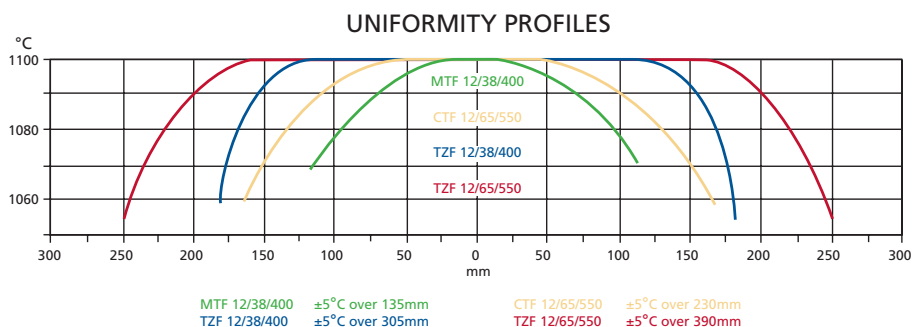
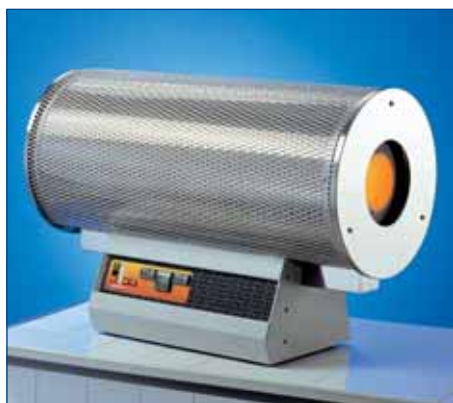


Table shows horizontal options

Wire embedded tube furnaces ~ three zone	GHC 12/450	GHC 12/600	GHC 12/750	GHC 12/900	GHC 12/1050	GHC 12/1200	HZS 12/600	HZS 12/900
Max. Temperature (°C)	1200	1200	1200	1200	1200	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100	1100	1100	1100	1100	1100
Heat up time (mins)	50	100	115	95	100	~		
Maximum o/d of Separate Worktube (to hold sample) (min 20mm)	170	170	170	170	170	170	110	110
Separate Worktube Length Required:								
heating in air (mm)	750	900	1050	1200	1350	1500	900	1200
heating with atmosphere (mm)	1050	1200	1350	1500	1650	1800	1200	1500
Heated Length (mm)	450	600	750	900	1050	1200	600	900
Overall Furnace Length (mm)	630	780	930	1080	1230	1380	750	1050
Horizontal Mounting on control box	✓	✓	✓	✓	✓	✓	✓	✓
Uniform length +/-5 (°C)	300	440	500	640	880	~	500	750
Thermocouple Type	N	N	N	N	N	N	N	N
Max .Power (W)	3100	3900	4600	5400	6200	7000	3000	4500
Holding Power (W)	1500	1800	2200	2800	2800	3100	~	1100
External Dimensions:								
H (mm)	672	672	672	672	672	672	350	350
W (mm)	676	827	976	1126	1276	1426	725	1050
D (mm)	468	468	468	468	468	468	410	410
Weight (kg)	6.5	40	51	55	~	~	40	65

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) Heat up time is measured at 100°C below max. temperature with an empty tube.



Table shows vertical options

Wire embedded tube furnaces ~ three zone	GVC 12/450	GVC 12/600	GVC 12/750	GVC 12/900	GVC 12/1050	GVC 12/1200	TVS 12/600	TVS 12/900
Max. Temperature (°C)	1200	1200	1200	1200	1200	1200	1200	1200
Continuous Temperature (°C)	1100	1100	1100	1100	1100	1100	1100	1100
Heat up time (mins)	75	80	92	111	122	81		
Maximum o/d of separate worktube	170	170	170	170	170	170	110	110
Separate worktube length required:								
Heating in air (mm)	750	900	1050	1200	1350	1500	900	1200
Heating with atmosphere (mm)	1050	1200	1350	1500	1650	1800	750	1050
Heated Length (mm)	450	600	750	900	1050	1200	600	900
Overall furnace Length (mm)	630	780	930	1080	1230	1380	750	1050
Versatile mounting:								
L stand / Wall bracket	✓	✓	✓	✓	✓	✓	✓	
Uniform length +/-5 (°C)	300	440	500	640	880	~	500	750
Thermocouple Type	N	N	N	N	N	N	N	N
Max Power (W)	3100	3900	4600	5400	6200	7000	3000	4500
Holding Power (W)	1500	1800	2200	2800	2800	3100		
H model (kg)	~	~	50	57	68	~	34	46
V model external dimensions:								
Height of stand to top of furnace								
H (mm)	1418	1418	1793	1860	1943	2018	700	1000
W (mm)	468	468	468	468	468	468	350	350
D (mm) Depth Includes stand	662	662	662	662	662	662	350	350
Weight (kg)	~	~	50	57	68	~	34	44
Clearance under furnace min & max (mm)	177-702	177-550	177-777	100-702	26-627	26-551		
V model control box dimensions:								
H x W x D 222 x 570 x 375 (mm)	✓	✓	✓	✓	✓	✓		

High temperature furnaces ~ three zone	TZF15/610	TZF16/610	TZF17/600	TZF18/600
Max. Temperature (°C)	1500	1600	1700	1800
Continuous Temperature (°C)	1400	1500	1600	1700
Heat up Time (mins)	75	~	150	150
Maximum o/d of separate worktube	90	90	90	90
Heated Length (mm)	610	610	600	600
Overall Furnace Length (mm)	1200	1200	950	950
Horizontal mounting on control box	✓	✓	✓	✓
Uniform Length +/-5 (°C)	450	450	500	500
Thermocouple Type	R	R	B	2
Max. Power (W)	8000	9000	9000	1000
External Dimensions:				
H (mm)	660	660	900	945
W (mm)	1130	1130	950	1020
D (mm)	445	445	630	740
Weight (kg)	44	44	180	200

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) Heat up time is measured at 100°C below max. temperature with an empty tube.



HVT 12/60/700

Vacuum Tube Furnaces

This range of 1200°C and 1500°C horizontal vacuum tube furnaces, offers vacuum levels of better than 10^{-5} mbar with a clean empty worktube.

The vacuum system and all controls are housed in the base with one end of the worktube joined to the vacuum system via a stainless steel radiused bend. Access to the tube is via the other end which is fitted with a removable stainless steel flange. Radiation shields are provided for both ends of the furnace to ensure maximum temperature uniformity with minimum loss of pumping speed.

These furnaces include two stage sliding vane rotary pump, water cooled oil diffusion pump, high vacuum baffle valve, roughing/backing valve(s) and Pirani and Penning gauges.

A number of special options is available including gas systems, automatic/semi-automatic vacuum systems, air cooled diffusion pump, cooling water failure alarm, special vertical and custom built designs.

Model	HVT 12/50/550	HVT 12/60/700	HVT 12/80/700	HVT 15/50/450	HVT 15/75/450
Max. Temperature (°C)	1200	1200	1200	1500	1500
Continuous Temperature (°C)	1100	1100	1100	1400	1400
Tube Inside Diameter (mm)	50	60	80	50	75
Heated Length (mm)	550	700	700	450	450
Max. Power (W)	2000	3000	3500	5500	5500
Holding Power (W)	1600	1800	2800	4800	4800
External Dimensions:					
H (mm)	1450	1450	1450	1565	1565
W (mm)	1700	1700	1700	1700	1700
D (mm)	600	600	600	600	600

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request, for most models.
- 3) Heat up time is measured at 100°C below max. temperature with an empty tube.
- 4) Extra information on Uniformity and heat up rate is available on request, due to information varying with application



Rotary Reactor Furnace

The Carbolite Rotary Reactor Furnace was developed by the Imperial College of Science and Technology, London and is designed for laboratory scale calcination and the production of high temperature reactions in a wide range of materials.

The Rotary Reactor combines all the advantages of the flo-solid (fluidised bed) furnace and the rotary kiln by providing both a controlled atmosphere and simultaneous agitation of powdered solids. Additionally, the unit overcomes the problem of long reaction times experienced by combustion in a muffle furnace or under flowing gases in a static tube.

Although originally designed for calcining colliery spoils at temperatures up to 1000°C, other applications include:

- calcining arsenical gold ores under neutral and oxidising atmospheres to remove sulphur and arsenic;
- analysis of sulphur in ores and metallurgical slags;
- as a low temperature rotary vacuum drier to remove organic solvent from oxide pigment materials;
- roasting sulphide ores to convert them to oxides;
- determination of silica content of rice husks;
- low temperature calcination of limestone and dolomite.



General Features

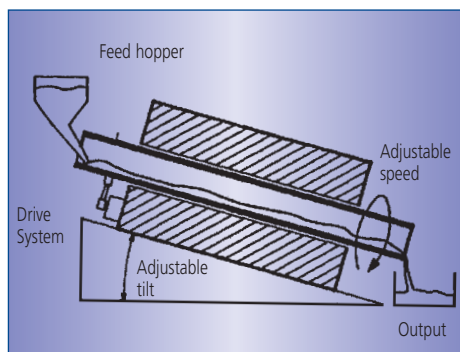
The latest PID microprocessor digital control system is incorporated, while stepped heating can be achieved by the use of an eight or twenty segment programmer. For maximum heat transfer and excellent temperature uniformity, high quality resistance wire elements are used. A positive break switch isolates power to the long-life resistance wire elements whenever the heating chamber is open. A removable exhaust box is provided for occasional cleaning and removal of condensates.

The oscillating fused silica reaction tube is fluted on the internal surface to ensure good mixing and uniform exposure of the particles to the atmosphere. The material is heated by radiation through the silica tube and the smooth internal profile allows easy loading, unloading and cleaning with minimal powder loss. Oscillation of the reaction tube is provided by an electric motor with variable speed control. Gas tight connections ensure the vessel is sealed.

An adjustable gas flowmeter with a 30mm scale, calibrated for N₂, is supplied as standard. Single or multiple flowmeters for different gases are available as options. The hinged heated chamber design allows easy access for removal and insertion of the quartz vessel. Atmosphere enters the quartz vessel through a flexible silicon rubber tube. The outlet end of the quartz vessel extends into a stainless steel exhaust box. A single gasket seal surrounding the quartz tube prevents atmosphere leakage. A gas outlet port in the exhaust box may be piped to an extraction system.

A wide range of microprocessor based temperature controllers and programmers is available.

Model	HTR11/75	HTR11/150
Max. Temperature (°C)	1100	1100
Internal vessel Dimensions	dia 75 x 100	dia 150 x 200
Internal vessel Capacity grams	120	950
Max capacity (ml)	50	700
Oscillation Frequency per min	1 to 8	1 to 8
Rotation angle in each direction	315°	315°
Heat up time (mins)(a)(b) without charge or gas flow	11	21
Cooling Time from 1000°C to 300°C with lid open (mins)	15	15
Thermocouple Type	K	K
Max. Power (W)	1500	3000
Holding Power (W)	400	1000
External Dimensions:		
lid position down:		
H (mm)	480	540
W (mm)	1140	1300
D (mm)	550	690
lid position up:		
H (mm)	800	950
W (mm)	1140	1300
D (mm)	680	900
Weight (kg)	40	95



Rotating Tube Furnace

This type of furnace allows powders to be heated and agitated inside a tube by using a rotating drive system. This ensures that all the powder is exposed to the atmosphere and provides laboratory scale simulation of industrial rotary calcining kilns.

Standard tube furnaces can be fitted with various options, including plain tubes in ceramic, quartz or heat resisting metal alloys, shaped vessels in metal or quartz incorporating agitation blades. The design includes a 0-5° tilting mechanism to control the throughput and can be fitted with vibration or screw inlet mechanisms, and output hoppers for continuous operation. Variable speed drives of 1-10rpm and atmosphere control systems are also available.

Based on standard furnaces CTF 12/75/700 or CTF 12/100/900, and STF 15 or 16/610.

Illustration of rotating tube furnace operation

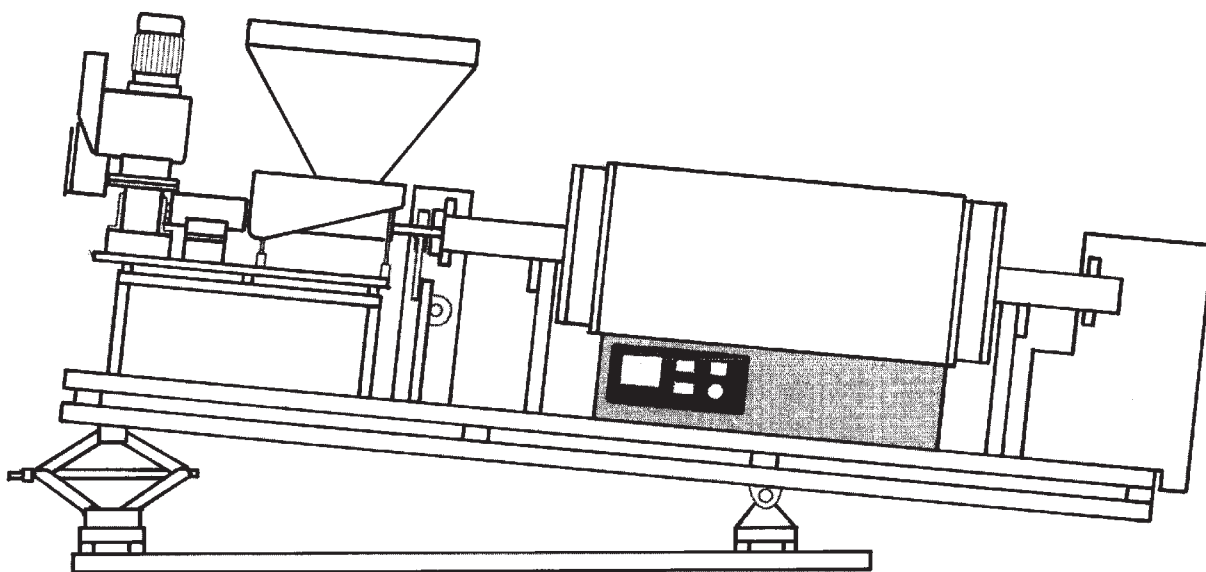


Illustration shows a standard tube furnace with rotating tube furnace accessories

Portable Thermocouple Calibration Furnace PTC 12/20

The Portable Thermocouple calibrator is a high stability heat source designed for the calibration of thermocouples up to Ø7.5 mm, with a maximum operating temperature of 1200°C.

Thermocouples are inserted into the worktube through an insulation plug and can be compared with the temperature indicator.

It is portable and self contained, with built in PID microprocessor controller and separate digital temperature indicator giving 1°C resolution.

The special worktube design results in a much higher temperature uniformity than is normally associated with a furnace of this size.

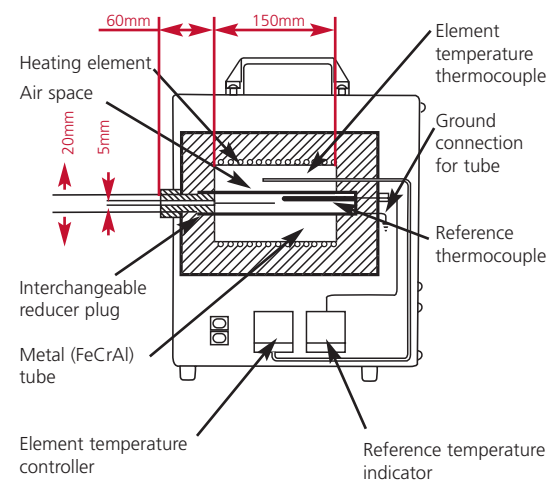
The metallic work tube is earthed for operator safety when used with metal sheathed mineral insulated thermocouples.

The PTC 12/20 can be used in a laboratory or in site as its rapid heat up and stabilisation make it ideal for quick set up.



PTC 12/20

1200°C Portable Thermocouple Calibration Furnace Model	PTC 12/20
Max. Temperature (°C)	1200
Continuous Temperature (°C)	1150
Temperature Range (°C)	400 - 1200
Stability	Better than +1°C
Overall Dimensions:	
H (mm)	399
W (mm)	310
D (mm)	225
Heated Length (mm)	150
Controller	Eurotherm 2132
Indicator	Eurotherm 2132
Heating Rate	20 mins (to 1150°C)
Cavity Diameter (mm)	20
Weight (kg)	8.8
Furnace Voltage	120/240 externally selectable
Max .Power (W)	1100
Thermocouple type	N



A Carbolite calibration certificate stating temperature error between work space temperature and indicated temperature, at 700°C, 900°C & 1100°C is provided as standard.

A NAMAS traceable calibration certificate is available for customer specified set points (as an optional extra). Price on Application.

A NAMAS traceable thermocouple is available and can be used for the customer to calibrate the unit at specified time intervals.

- 1) Holding power is measured at 100°C below max. temperature, based on 240V supply, with an empty chamber.
- 2) Uniformity graphs are available on request.
- 3) Heat up time is measured at 100°C below max. temperature with an empty chamber.



AGD 12

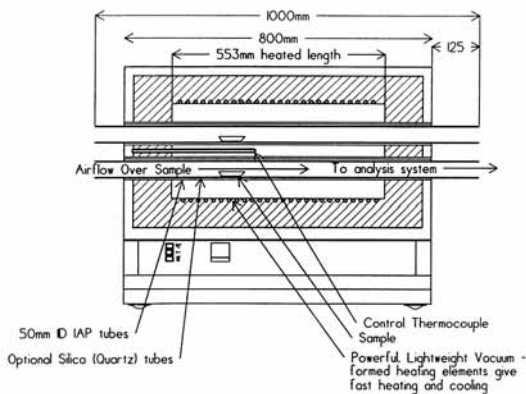
Acid Gas Determinator

Designed for the combustion of electrical cable insulation BS 6425: Part 1 and 2 1990

In this test, cable samples are heated within a worktube at a programmed rate of rise; four samples can be processed simultaneously. A small flow of air is passed over the samples and then collected and analysed for acidity.

Features:

- Four tube design offers increased working capacity
- Powerful elements provide 1200°C maximum temperature and fast heating - greater than 20°C/minute to 1000°C
- Low thermal mass insulation allows fast cooling between tests
- Digital temperature control offers precise setting of temperature, repeatability and stability. The rate of rise of temperature and maximum temperature can be pre-set. A programmer is available to give automatic cooling after the timed hold at maximum temperature, as an option.



Model	AGD 12/4
Max. Temperature (°C)	1200
Furnace Tubes (included)	Four IAP tubes 50 x 60 x 800mm, arranged 2 above 2
Inner Tubes (optional)	Four clear fused silica (SiO ₂) tubes 41 x 45 x 1000mm (Note: silica tends to devitrify when used above 1000°C)
Heated Length (mm)	550
Heating Rate	Less than 40 minutes to 800°C (better than 20°C/min to 1000°C)
Temperature Uniformity	The temperatures at the centre of each of the four silica tubes will be within ±5°C of each other over a 300mm length, with no gas flow (BS 6425 requires ±17.5°C over 300mm with a small gas flow)
Heating Elements	Resistance wire spirals embedded in the inner surface of vacuum formed ceramic fibre cylinders
Thermocouple Type	N
Power Control	Solid state relay incorporating zero voltage switching
Power Supply	220/240V, 50/60Hz, single phase, 20 amp
External Dimensions	640mm (h) x 800mm (w) x 480mm (d) excluding tubes

- 1) Uniformity graphs are available on request, for most models.
- 2) Heat up time is measured at 100°C below max. temperature with an empty chamber.

