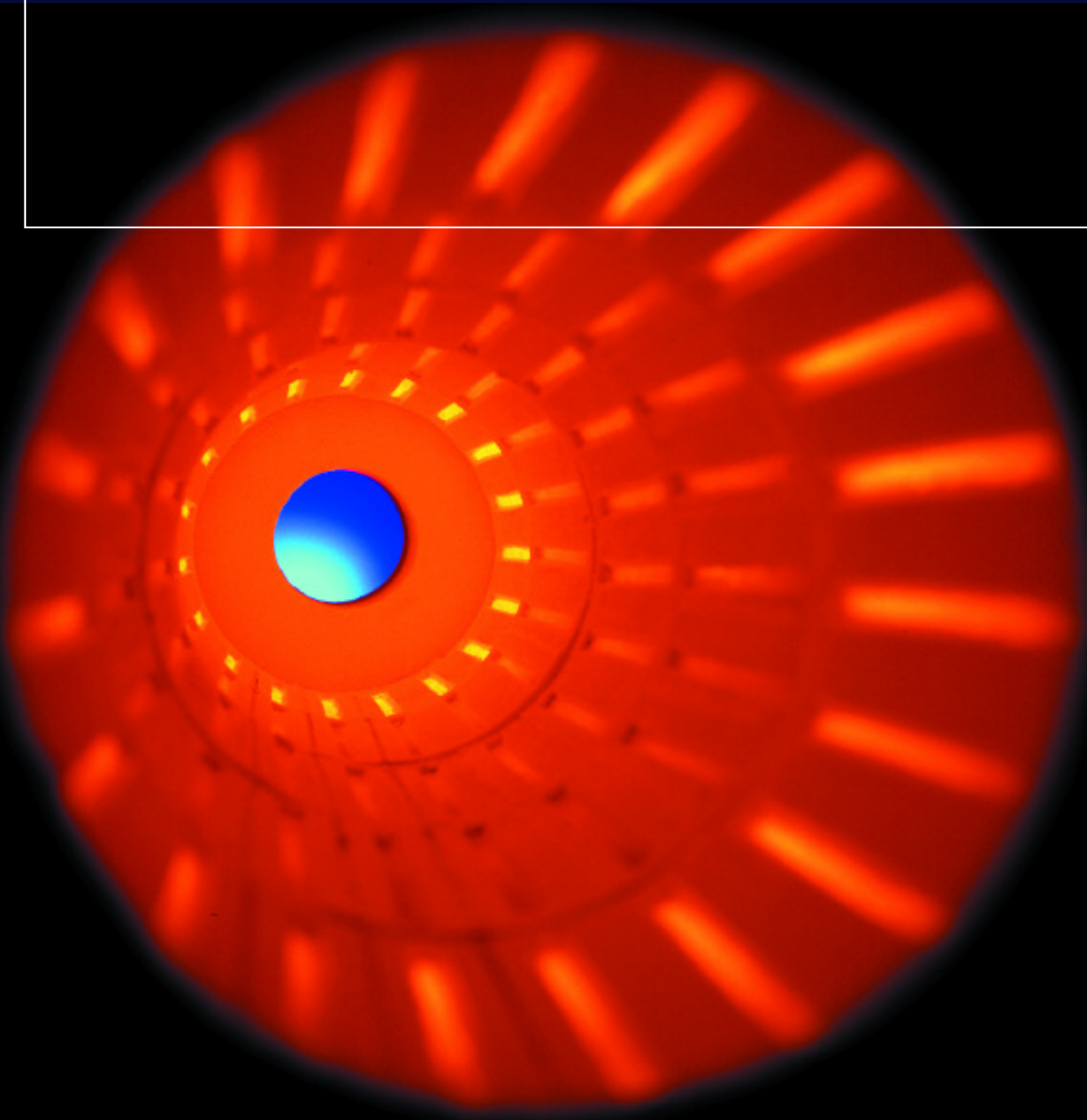




Featuring



Laboratory Chamber & Tube Furnaces





The Technology of Heat

Innovative from the start in Sheffield in 1938 Carbolite took its name from the silicon carbide elements at the heart of its new high temperature combustion furnaces. In the intervening years Carbolite has developed to become the UK's largest manufacturer laboratory and industrial furnaces and ovens, exporting a wide range of standard and bespoke designs to over 100 countries World-wide.

From our location in the heart of the Peak District National Park, Carbolite has established a reputation for engineering expertise derived from literally hundreds of man-years of practical experience in thermal engineering technology. Expertise that is clearly demonstrated in the quality of design and manufacture of our standard products and that is absolutely vital when interpreting customer's applications into bespoke temperature control solutions. It is this depth of experience in design and manufacture, combined with a wealth of understanding in materials performance and control systems at high temperature, which distinguishes Carbolite from the competition.

Continual product development and strong, interactive relationships with our suppliers lets us incorporate the very latest technologies into our products, keeping us at the forefront in furnace design. One of our most recent developments is the CMAT (Microwave Assist Technology) Furnace, which combines radiant heating furnace technology with the direct heating effect of microwave energy.

Chamber furnaces, with volumes ranging from 3 litres to 10,000 litres, together with single and multi-zone tube furnaces with horizontal, vertical and split tube configurations are supplied equipped with everything from simple set-point controllers, to sophisticated multiple zone, cascade and programmable, temperature control systems.

In addition to versatile general laboratory products Carbolite also manufacture a range of application specific furnaces for such uses as Clean Room installations, Strip and Rotary Hearth and Rotary Tube furnaces. As well as for standard compliant testing such as Ashing, Coal & Coke standard analysis techniques, Iron Ore Reduction, Precious Metals Assay, Asphalt Binder Analysis, Tensile Testing and much more.

Carbolite's flexibility and capability to solve customer's individual application requirements have given our products an important place in chemical, materials science, engineering and industrial research, testing and development laboratories, as well as for pilot and production scale manufacturing within aerospace, automotive, surface treatment, tooling, ceramics, glass, pharmaceutical, chemicals, plastics, engineering, electronics, mining & extraction, iron & steel, as well as coal & coke industries around the World.

Carbolite not only regularly supplies products with standards compliant furnace designs, such as for NADCAP (AMS2750D) heat treatment processes, but can also supply fully traceable certification for control, measurement, recording and data acquisition devices, issued by an independent UKAS / NAMAS accredited laboratory.

All of the products featured in this catalogue and more, are available through an extensive Worldwide network of dealers and local offices. Our factory trained field engineers provide a complete range of after sales support and technical advice and guidance on product selection is available from a team of qualified engineers based at Hope, or via our website www.carbolite.com



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Construction of standard laboratory furnaces is only part of the picture for Carbolite. We are regularly asked to design furnaces either to meet specific the requirements of specific customer's applications, or to enable the use standard test methods such as those for iron ore reduction or coal and coke testing.

Similarly when customer's must perform operations within standards compliant regimes such as AMS 2750D or NADCAP for heat treatment applications, then Carbolite have the experience and skills to modify standard designs or engineer bespoke solutions in order to achieve the appropriate levels of compliance.

Perhaps most frequent of all is the situation whereby customers see a standard model but simply require it a little larger or smaller or to reach a higher temperature. So if you cannot see precisely what you need in our standard range simply get in touch.



ROTATING HEARTH FURNACE



A 4 LANE STRIP FURNACE TO OPERATE AT 1100°C



TUMBLER FOR
ISO 4696-1 TESTING



THREE ZONE 1200°C TUBE FURNACE
WITH WATER COOLING



LARGE CAPACITY 1200°C FURNACE WITH
MODIFIED ATMOSPHERE RETORT



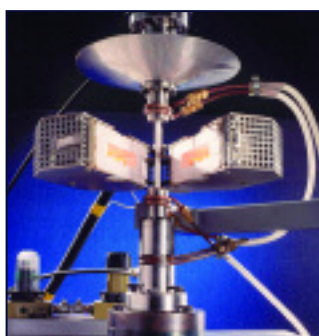
THERMAL TEST RIG FOR THE
CALIBRATION OF THERMAL
INDICATOR PAINTS



THERMAL CYCLING TEST FURNACE TO CYCLE
THERMOCOUPLES BETWEEN UP TO 1200°C &
AMBIENT FOR 1000S OF CYCLES



COMBINED TEST UNIT FOR ISO 4695 IRON
ORE REDUCIBILITY & ISO 4696-1
LOW TEMPERATURE DISINTEGRATION



HIGH TEMPERATURE 1500°C
SPLIT TUBE FURNACE FOR
EXTENSION TESTING



LARGER CAPACITY ROTATING TUBE FURNACE

CHAMBER FURNACES

Selection of a Furnace

Factors for Chamber Furnace

- ✦ Chamber furnaces enable larger or more awkwardly shaped loads to be heated.
- ✦ The size of the chamber and how it is to be loaded and unloaded determine which style of furnace is best for a given application.
- ✦ For applications involving chemical vapours, gases or humidity always check with Carbolite or your local dealer which furnaces and elements will be best for your application.

Temperature

- ✦ At Carbolite all products that heat above 600°C using radiant (rather than convection) heating are classified as furnaces.
- ✦ Carbolite chamber furnaces are available with maximum operating temperatures from 750°C to 1,800°C.
- ✦ The chart indicates the models with their maximum operating temperatures and heating method.
- ✦ Continuous operation of a furnace at its maximum temperature will reduce its working life. Continuous operating temperature should be approximately 100°C below maximum.
- ✦ Furnaces are designed and calibrated to operate at high temperatures. Continuous operation below furnace temperatures (of approximately 600°C) will be less accurate and may reduce element life in high temperature furnaces.
- ✦ Each furnace has a uniform working volume; this is a three dimensional region that is controlled within the specified tolerances for temperature uniformity. Select a chamber where this uniform volume is large enough to accommodate the item/s to be heated.

Chamber Design

- ✦ The simplest and least expensive options are front opening designs with side hinged doors.
- ✦ Front opening 'up and away' vertical lifting doors keep the heated door surface away from the operator offering increased operator comfort and safety.
- ✦ Where tall objects and crucibles need lifting in and out of the chamber, vertical loading chambers with heating elements in the side are available.
- ✦ Bottom loading or 'raised hearth' furnaces offer the ability to rapidly heat items by lifting them up into the chamber or lowering the hearth to cool them.
- ✦ For heavier loads, moving the furnace chamber using a top hat design is a more practical solution.

Modified Atmosphere

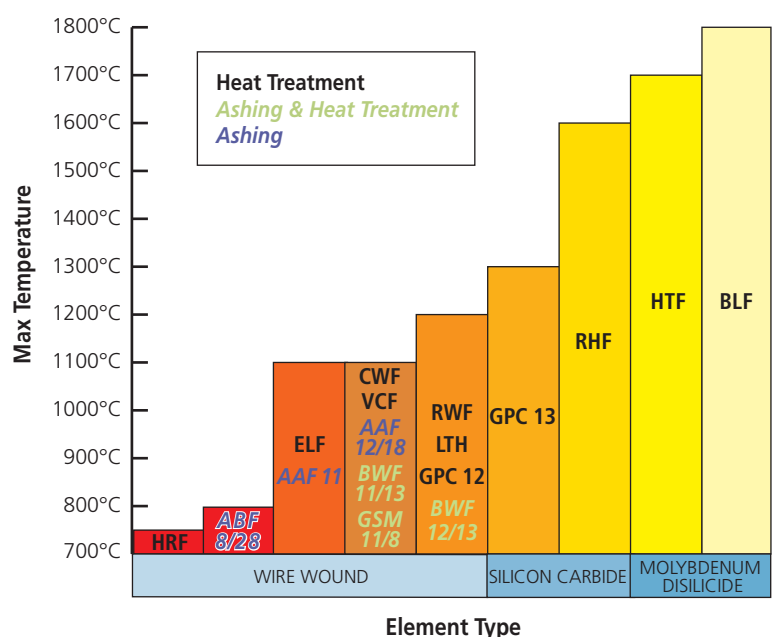
- ✦ To work with inert gases or a modified atmosphere specify one of the following modifications at the time of ordering
 - ✦ A gasket sealed or sand sealed retort in a front opening chamber furnace
 - ✦ An inverted crucible on a modified hearth in a bottom loading or top hat furnace.

Temperature Control

- ✦ Carbolite furnaces are supplied as standard with accurate PID (proportional integral, derivative) single 'ramp to set-point' controllers providing accurate control and negligible overshoot of the set temperature.
- ✦ Multisegment and or multi-programme controllers are available as an alternative option for most models.
- ✦ Wherever a furnace will be left operating unattended, or where the user wishes to protect a valuable workload or the furnace elements from damage from accidental overheating then an over-temperature protection device is strongly recommended.

Application Specific & Bespoke Designs

- ✦ Carbolite both designs and builds all of the furnaces within the catalogue range, therefore many 'off the shelf' modifications are available as well as fully bespoke customised furnaces for specific customer applications.
- ✦ Carbolite can provide a variety of mechanisms for loading and unloading items from the furnace, or for the automation of temperature cycling or quenching.



ELF Chamber Furnaces

Standard features

- ✓ 1100°C maximum operating temperature
- ✓ 6, 14 or 23 litre chamber volumes
- ✓ Tilt forward, drop down door, with air gap to minimise external temperature
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start & process timer function as standard
- ✓ Vacuum formed, low thermal mass insulation
- ✓ Hard ceramic hearth fitted as standard
- ✓ Ventilated, via top mounted ceramic chimney

Options

specify these at time of order

- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)



ELF 11/6

An economical furnace designed for light duty and general laboratory work. Low thermal mass insulation and multiple semi-embedded, free radiating wire wound elements in the chamber sides provide efficient heating.

Ventilation is via a top-mounted ceramic chimney, but if toxic or corrosive fumes are likely, use of one of our dedicated ashing furnaces or a retort should be considered.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Temperature uniformity of $\pm 5^{\circ}\text{C}$ within H x W x D (mm)	Volume (litres)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)						
ELF 11/6	1100	35	165 x 180 x 210	580 x 410 x 420	115 x 130 x 130	6	2000 900	K	24	230V single phase
ELF 11/14	1100	40	210 x 220 x 310	630 x 450 x 520	130 x 140 x 220	14	2600 1300	K	31	single or 3 phase
ELF 11/23	1100	29	235 x 255 x 400	715 x 505 x 690	665 x 455 x 610	23	5000 1500	K	52	single or 3 phase



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at continuous operating temperature.

External dimensions with door closed and include chimney.

CWF General Purpose Chamber Furnaces

Standard features

- ✓ 1100°C, 1200°C or 1300°C maximum operating temperature
- ✓ 5, 13 or 23 litre chamber volumes
- ✓ Up & away door, keeps heated surface away from the user
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start & process timer function
- ✓ Hard wearing alumina element carriers, entrance & hearth
- ✓ Energy efficient low thermal mass insulation
- ✓ Free radiating wire wound elements, pitched for optimum uniformity
- ✓ Easy access to elements & controls, simplifies maintenance & servicing



CWF 12/13/301

Options

specify these at time of order

- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ 2 phase supply
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications
- ✦ A variety of retorts & modifications are available for working with modified atmospheres

A modern design is combined with traditional know-how & technology, to provide a robust and reliable furnace. Easy to access replaceable heating modules makes maintenance simple.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Temperature uniformity of $\pm 5^{\circ}\text{C}$ within H x W x D (mm)	Volume (litres)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)						
CWF 11/5	1100	30	135 x 140 x 250	585 x 375 x 485	85 x 90 x 110	5	2400 790	K	30	230V single phase
CWF 11/13	1100	80	200 x 200 x 325	655 x 435 x 610	120 x 120 x 185	13	3100 1500	K	47	230V single or 2 phase
CWF 11/23	1100	40	235 x 245 x 400	705 x 505 x 675	155 x 165 x 285	23	7000 1900	K	68	Universal
CWF 12/5	1200	35	135 x 140 x 250	585 x 375 x 485	85 x 90 x 125	5	2400 850	R	30	230V single phase
CWF 12/13	1200	65	200 x 200 x 325	655 x 435 x 610	120 x 120 x 200	13	3100 1550	R	47	230V single or 2 phase
CWF 12/23	1200	45	235 x 245 x 400	705 x 505 x 675	155 x 165 x 325	23	7000 2250	R	68	Universal
CWF 13/5	1300	40	135 x 140 x 250	585 x 375 x 485	85 x 90 x 150	5	2400 1000	R	30	230V single phase
CWF 13/13	1300	80	200 x 200 x 325	655 x 435 x 610	120 x 120 x 225	13	3100 1800	R	47	230V single or 2 phase
CWF 13/23	1300	55	235 x 245 x 400	705 x 505 x 675	155 x 165 x 340	23	7000 2500	R	68	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

RWF Rapid Heating Chamber Furnaces

Standard features

- ✓ 1100°C or 1200°C maximum operating temperature
- ✓ 5, 13 or 23 litre chamber volumes
- ✓ Ambient to 1100°C in as little as 10 minutes
- ✓ Rapid thermal response from free radiating coiled wire elements
- ✓ Low thermal mass insulation for fast response & energy efficiency
- ✓ Up & away door, keeps heated surface away from the user
- ✓ Carbolite 301 controller, with single ramp to set-point & process timer
- ✓ Hard wearing, dust free hearth
- ✓ Robust alumina element carriers, entrance & hearth
- ✓ Easy access to elements & controls, simplifies maintenance & servicing



RWF 12/5/301

Options

specify these at time of order

- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ 2 phase supply at no extra cost above 13 litres
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications
- ✦ A variety of retorts & modifications are available for working with modified atmospheres

Free radiating wire-wound elements and highly efficient low thermal mass insulation are combined to provide a furnace for light to medium laboratory applications where rapid thermal response is important.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)					
RWF 11/5	1100	10	130 x 160 x 250	585 x 375 x 485	5	2750 680	K	28	230V single phase
RWF 11/13	1100	11	195 x 210 x 325	655 x 435 x 610	13	5000 1200	K	45	230V single or 2 phase
RWF 11/23	1100	13	220 x 260 x 400	705 x 505 x 675	23	9100 1800	K	65	Universal
RWF 12/5	1200	12	130 x 160 x 250	585 x 375 x 485	5	2750 820	R	28	230V single phase
RWF 12/13	1200	13	195 x 210 x 325	655 x 435 x 610	13	5000 1450	R	45	230V single or 2 phase
RWF 12/23	1200	15	220 x 260 x 400	705 x 505 x 675	23	9100 2100	R	65	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measure at continuous operating temperature.

GPC Larger Capacity Laboratory Chamber Furnaces

Standard features

- ✓ 1200°C or 1300°C maximum operating temperature
- ✓ 36, 65, 131 or 200 litre chamber volumes
- ✓ Free radiating coiled wire elements
- ✓ Low thermal mass insulation for fast response & energy efficiency
- ✓ Up & away door, keeps heated surface away from the user
- ✓ Carbolite 301 controller, with single ramp to set-point & process timer
- ✓ Hard wearing refractory hearth plate, resists damage & supports heavier loads
- ✓ Heating elements are easily serviced from the front of the chamber



GPC 12/36/3216P1

Options

specify these at time of order

- ◆ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ◆ 8 or 20 segment programmer
- ◆ RS232 communications
- ◆ A range of inconel (NiCr) retorts to work with modified atmospheres up to 1100°C

Designed for general workshop and laboratory use the GPC range has the styling and features of the laboratory furnace range with the advantages of a larger chamber size and higher loading capacity.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)					
GPC 12/36	1200	37	250 x 320 x 450	810 x 690 x 780	36	9000	R	100	Universal
GPC 12/65	1200	40	278 x 388 x 595	885 x 780 x 945	65	14000	R	165	3 phase
GPC 12/131	1200	150	350 x 500 x 750	1652 x 1110 x 1280 Floorstanding	131	18000	R	400	3 phase
GPC 12/200	1200	–	400 x 600 x 900	1702 x 1350 x 1350 Floorstanding	200	24000	R	518	3 phase
GPC 13/36	1300	47	250 x 320 x 450	810 x 690 x 780	36	9000	R	120	Universal
GPC 13/65	1300	45	278 x 388 x 595	885 x 780 x 945	65	14000	R	165	3 phase
GPC 13/131	1300	–	350 x 500 x 750	1652 x 1110 x 1280 Floorstanding	131	18000	R	400	3 phase

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at continuous operating temperature.

VCF Top Loading Laboratory Chamber Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ 5, 10, 23 or 100 litre chamber volumes
- ✓ Free radiating wire elements in all 4 sides of chamber
- ✓ Vented top opening door
- ✓ Angled control panel, protected but clearly visible
- ✓ Carbolite 301 controller, with single ramp to set-point & process timer
- ✓ Thermocouple protected by ceramic sheath
- ✓ Top accessible elements for easy servicing

Options

specify these at time of order

- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications



VCF 12/5/3508/P10

A floor standing furnace design which is particularly suitable for applications involving tall crucibles or heavy samples, where the top loading format makes sample handling much easier.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)		Holding power (W)			
VCF 12/5	1200	102	260 x 155 x 130	660 x 530 x 405 Floorstanding	5	2500 900	R	50	Single phase
VCF 12/10	1200	138	365 x 180 x 155	765 x 555 x 430 Floorstanding	10	3000 1200	R	60	Single phase
VCF 12/23	1200	125	450 x 250 x 200	850 x 600 x 500 Floorstanding	23	6000 2500	R	130	Optional Universal
VCF 12/100	1200	150	600 x 410 x 410	1100 x 930 x 950 Floorstanding	100	15000 6000	R	200	3 phase

'Universal' models are easily altered between 1 phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

HRF Air Recirculating Chamber Furnaces

Standard features

- ✓ 750°C maximum operating temperature
- ✓ 22, 112 or 324 litre chamber volumes
- ✓ Resistance wire elements in both sides of chamber
- ✓ Stainless steel liner
- ✓ Combination of low thermal mass and refractory board insulation.
- ✓ Carbolite 301 controller, with single ramp to set-point & process timer
- ✓ Safe outer case temperature



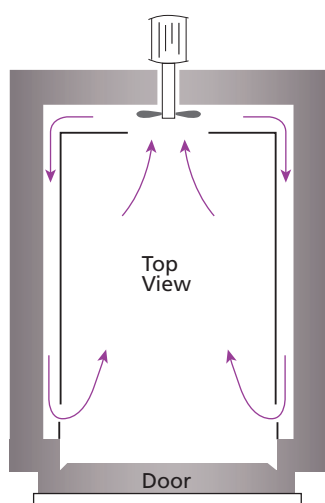
HRF 7/22/301

A powerful fan and airguide system provides good uniformity and rapid heat transfer for applications such as; stress relieving, tempering, normalising and annealing. The stainless steel liner has 3 shelf runners with shelves available as an additional option.

Options

specify these at time of order

- ◆ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ◆ 8 or 20 segment programmer
- ◆ RS232 communications
- ◆ Shelves & runners



HRF air Flow

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)					
HRF 7/22	750	63	220 x 200 x 495	590 x 450 x 870	22	3000	K	61	Single phase
HRF 7/112	750	–	400 x 400 x 700	1550 x 1000 x 1600	112	18000	K	480	3 phase
HRF 7/324	750	–	600 x 600 x 900	1800 x 1200 x 2280	324	24000	K	1000	3 phase



External dimensions with door closed and include chimney.

LTH Top Hat Chamber Furnaces

Standard features

- ✓ 1100°C or 1200°C maximum operating temperature
- ✓ 3.5, 31 & 49 litre chamber
- ✓ Rapid heating powerful free radiating wire elements & efficient low thermal mass insulation
- ✓ Rapid sample cooling can be achieved by raising the chamber
- ✓ Electrically operated element chamber (the 3.5 litre chamber raises or lowers in 5 seconds)
- ✓ Chamber rises to full internal height for easy loading
- ✓ All around heating chamber provides maximum heat transfer & uniformity
- ✓ During loading elements switch off & are fully retracted
- ✓ Separate control module on 2 metre conduit for 3.5, 31 & 49 litre models
- ✓ Hard wearing ceramic hearth
- ✓ Two handed elevator operation, with audible alarm and emergency stop button, for operator safety



LTH 11/49

Options

specify these at time of order

- ✦ Over-temperature protection (always recommended for unattended operation or protection of valuable samples)
- ✦ Optional gas inlet
- ✦ Refractory metal bell jar to improve gas usage when working with modified atmosphere
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications
- ✦ Optional leg extension stand for LTH/31 (illustrated)



LTH 12/3

LTH 11/31 + STAND

This furnace configuration enables very easy sample loading and rapid heating and cooling from lowering and raising the heated chamber on the hearth. It is also ideal for use with a modified atmosphere using an inverted crucible and optional gas inlet hearth.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)					
LTH 12/3	1200	—	200 x 150	655 x 410 x 540 222 x 570 x 375	3.5	3000	R	38	Single phase
LTH 11/31	1100	—	500 x 50 x 250	1900 x 500 x 600 370 x 225 x 375	31	8000	N		3 phase
LTH 11/49	1100	—	400 x 350 x 350	2200 x 640 x 1057	49	9000	N		3 phase



Continuous operating temperature is 100°C below maximum temperature.

RHF Silicon Carbide Heated Furnaces to 1600°C

Standard features

- ✓ 1400°C, 1500°C or 1600°C maximum operating temperature
- ✓ 3, 8, 15 or 35 litre chamber volumes
- ✓ Silicon carbide heating elements, providing long life at elevated temperatures & able to withstand the stresses of intermittent operation
- ✓ Carbolite 301 PID controller, with single ramp to set-point & process timer
- ✓ Controllers extend heating performance by compensating for the effects of element ageing
- ✓ Hard wearing refractory brick hearth and door surrounds
- ✓ Low thermal mass chamber insulation for energy efficiency & rapid heating & cooling

Options

specify these at time of order

- ✦ 2 phase electrical supply for 3 litre models (& for RHF 14/8)
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ 8 or 20 segment programmer
- ✦ RS232, RS485 communications
- ✦ A range of furnace tables & floor stands are available



RHF 16/3/3508P1

Typically reaching 1400°C in under 40 minutes the RHF range provides rapid heating and is ideally suited to the rigorous firing cycles demanded from laboratory furnaces.

Power Supplies for Silicon Carbide Furnaces

The characteristics of the control systems that are used with silicon carbide elements result in maximum power supply requirements that are not as intuitively derived as those for furnaces using other heating technologies. For this reason a more detailed description of the maximum power supply that is required per phase has been included in the specification table.

RHF Silicon Carbide Heated Furnaces to 1600°C

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply required per phase
			Internal H x W x D (mm)	External H x W x D (mm)		Supply Required (W)			
RHF 14/3	1400	33	120 x 120 x 205	655 x 435 x 610	2.9	4500 1900	R	42	<i>a1</i> =30A, <i>a2</i> =15A
RHF 14/8	1400	22	170 x 170 x 270	705 x 505 x 675	7.8	8000 3200	R	64	<i>a1</i> =50A, <i>a2</i> =25A
RHF 14/15	1400	35	220 x 220 x 310	810 x 690 x 780	15	10000 2900	R	125	<i>a1</i> =62A, <i>h3</i> =22A, <i>d3</i> =38A
RHF 14/35	1400	38	250 x 300 x 465	885 x 780 x 945	35	16000 6000	R	179	<i>h3</i> =35A, <i>d3</i> =60A, <i>k3</i> =35A
RHF 15/3	1500	45	120 x 120 x 205	655 x 435 x 610	2.9	4500 2000	R	46	<i>a1</i> =36A, <i>a2</i> =18A
RHF 15/8	1500	40	170 x 170 x 270	705 x 505 x 675	7.8	8000 3500	R	61	<i>h3</i> =17.5A, <i>d3</i> =30A, <i>b3</i> =38A, <i>g3</i> =17.5A
RHF 15/15	1500	46	220 x 220 x 310	810 x 690 x 780	15	10000 3000	R	125	<i>a1</i> =75A, <i>h3</i> =25A, <i>e3</i> =43A
RHF 15/35	1500	46	250 x 300 x 465	885 x 780 x 945	35	16000 6200	R	178	<i>h3</i> =35A <i>e3</i> =60A, <i>g3</i> =35A, <i>j3</i> =5A
RHF 16/3	1600	42	120 x 120 x 205	655 x 435 x 610	2.9	4500 2300	R	42	<i>a1</i> =36A, <i>a2</i> =8A, <i>a3</i> =30A
RHF 16/8	1600	35	170 x 170 x 270	705 x 505 x 675	7.8	8000 4000	R	61	<i>h3</i> =18A, <i>e3</i> =29A, <i>b3</i> =34A, <i>g3</i> =18A, <i>k3</i> =18A
RHF 16/15	1600	58	220 x 220 x 310	810 x 690 x 780	15	10000 3500	R	140	<i>a1</i> =73A, <i>h3</i> =25A, <i>a3</i> =42A, <i>k3</i> =25A
RHF 16/35	1600	56	250 x 300 x 465	885 x 780 x 945	35	16000 1100	R	179	<i>h3</i> =40A, <i>e3</i> =62A, <i>g3</i> =37A, <i>k3</i> =40A
<i>a1</i> =Single 200-240V, <i>a2</i> =380-415V 2 phase + N, <i>a3</i> =200-240V 3 phase delta, <i>b3</i> =200-208V 3 phase delta, <i>d3</i> =200-220V 3 phase delta, <i>e3</i> =230-240V 3 phase delta, <i>g3</i> =380-415V 3 phase no N, <i>h3</i> =380-415V 3 phase + N, <i>j3</i> =440-480V 3 phase no N, <i>k3</i> =440-480V 3 phase + N									



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

MRF 16/22 CMAT Microwave Assist Technology Furnace

Standard features

- ✓ 1600°C maximum operating temperature
- ✓ Purpose built design, revolutionary microwave assist technology furnace
- ✓ Simultaneous direct heating of microwave susceptible materials & radiant heating by molybdenum disilicide elements
- ✓ Independent control of microwave & radiant heating
- ✓ 20 Segment programmable PID control
- ✓ Over-temperature protection
- ✓ Manual or programmable control of both heat sources
- ✓ Double safety interlock, cuts power on door opening
- ✓ Safety limits for microwave containment to BS EN 60519-6:2002 part 6.1 (emissions <5mW/cm² @ 50mm)



MRF 16/22

Options

specify these at time of order

- ✦ Ability to store & re-use additional programs
- ✦ Fixed or wheeled stands
- ✦ DAQ or graphical recorders
- ✦ Microwave test meter
- ✦ RS232 or RS485 communications

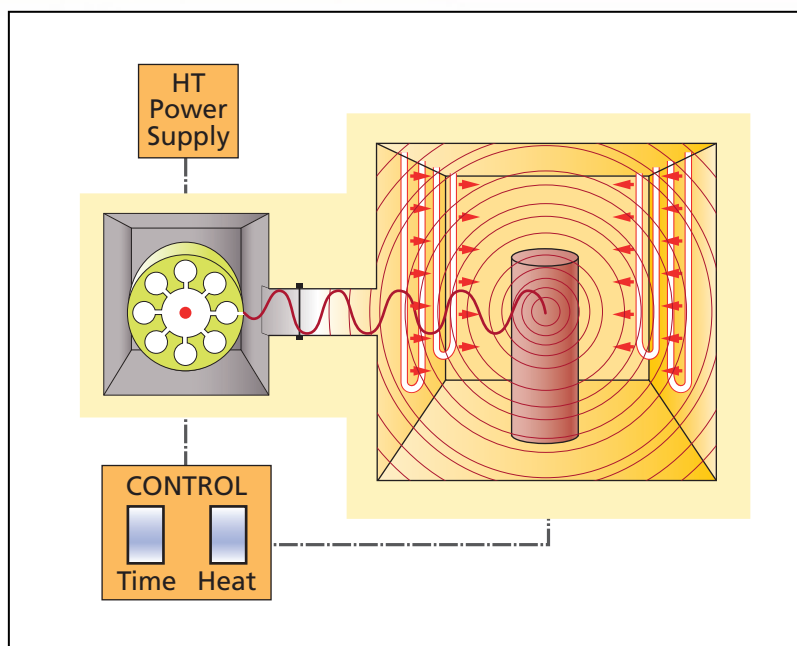
The capability to heat samples using the combined effects of radiant heating and direct microwave heating using a purpose built MAT (microwave assist technology furnace).

Independent control of radiant heating and either continuous or pulsed microwave energy from 0 to 100% of output level.

Model	Max temp (°C)	Heat-up time (mins)	Radiant heating power (kW)	Micro power (kW)	Micro Freq'y (MHz)	Dimensions		Volume (litres)	Max distributed load (kg)	Net Weight (kg)	Power supply
						Internal H x W x D (mm)	External H x W x D (mm)				
MRF 16/22	1600	12	9	1.8	2450	232 x 245 x 396	1090 x 910 x 925	22	7.5	290	3 phase



CMAT – Carbolite Microwave Assist Technology



Background

Carbolite CMAT furnaces have been developed to use in combination, radiant heating elements and microwave energy using a method pioneered by UK technology and innovation company C-Tech*.

Having tested prototype furnaces and kilns they sought organisations able to commercialise the concept in a standard furnace design. Carbolite holds the European license to develop and commercialise this technology and from this has developed our CMAT furnaces. Our strong working relationship with the North American license holder who offers support means that Carbolite is able to supply the unique benefits of the MRF 16/22 world wide.

The Benefits of MAT (Microwave Assist Technology)

The MRF offers the potential for improved:

- ✦ Sintering densities at lower temperatures, using less energy.
- ✦ Sequential removal of binder (burn-off) and sintering, by preferentially heating binders.
- ✦ Reduced energy consumption by rapid direct heating of the sample.
- ✦ More uniform heating effects throughout the sample providing similar crystal structure and phase boundary properties at the surface and within the sample interior.

In a conventional furnace when the surface of a sample is heated by radiation the internal volume of the sample only heats through conduction. The limiting speed of conduction causes a thermal gradient to form which can

result in early surface hardening followed by cracking and bloating of the surface.

In the CMAT, sample materials which are susceptible to microwave interaction couple with the microwave energy to cause frictional heating at the molecular level throughout the volume of the sample.

To be susceptible to microwave heating a material should have components which have a high dielectric potential but where the molecular structure produces enough frictional resistance to these components aligning with the oscillating microwave energy for frictional heating to occur.

The MRF 16/22 uses a 2.45 MHz magnetron emitting energy at 1.8kW to generate this effect, in addition to molybdenum disilicide radiant heating elements. Unlike devices which simply use microwaves to heat susceptible blocks which then radiate heat onto the sample, the CMAT furnace is able to heat the sample using both infrared radiant heat and microwaves. The MRF 16/22's fully flexible programmable controller enables the sequence, intensity and phasing (pulsed or continuous microwave) of the radiant and microwave heating effects to be combined with unmatched flexibility.

The MRF 16/22 is unique in concept yet manufactured to a standard repeatable design.

*C-Tech Innovation Limited
Capenhurst Technology Park
Capenhurst
Chester
CH1 6EH

HTF High Temperature Chamber Furnaces

Standard features

- ✓ 1700°C & 1800°C maximum operating temperature
- ✓ From 4 to 27 litre capacities
- ✓ Outstanding performance from molybdenum disilicide heating elements
- ✓ Up & away parallel opening door, keeps hot face away from user
- ✓ Compatible with intermittent or continuous use
- ✓ Advanced refractory interior, used in combination with energy efficient low thermal mass insulation
- ✓ 8 Segment programmable controller incorporating over-temperature protection
- ✓ Digital RS232 communications (HTF17/5, HTF17/10, HTF18/4 & HTF18/8)
- ✓ Fan cooling for low external case temperature.



HTF 17/10/3216P1

Options

specify these at time of order

- ✦ Optional 2 phase electrical supply for 3 litre models (& for RHF 14/8)
- ✦ 20 Segment programmable controller
- ✦ RS232 & RS485 communications (RHF17/25, HTF18/15 & HTF18/27)
- ✦ Fieldbus & Ethernet connectivity
- ✦ A range of data acquisition devices & chart recorders

Suitable for either intermittent or continuous operations these furnaces provide dependable high temperature performance with programmable control and overtemperature protection as standard.



HTF 18/27/3216P1

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Digital RS232 Comms	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)						
HTF 17/5	1700	50	158 x 150 x 225	565 x 830 x 650 Bench mounted	5	4050	Standard	B	109	Single
HTF 17/10	1700	44	227 x 200 x 225	565 x 830 x 650 Bench mounted	10	5920	Standard	B	176	Single or 2 phase
RHF 17/25	1700	45	300 x 275 x 300	1800 x 1100 x 680 Floor standing	25	9600	Option	B	515	3 phase
HTF 18/4	1800	65	140 x 140 x 190	565 x 830 x 650 Bench mounted	4	4650	Standard	20/40	175	Single phase
HTF 18/8	1800	56	210 x 190 x 190	565 x 830 x 650 Bench mounted	8	6200	Standard	20/40	331	Single or 2 phase
HTF 18/15	1800	70	220 x 220 x 300	1580 x 690 x 800 Floor standing	15	6316	Option	20/40	365	Single, 2 or 3 phase
HTF 18/27	1800	55	300 x 300 x 300	1610 x 780 x 945 Floor standing	27	8180	Option	20/40	509	3 phase



Continuous operating temperature is 100°C below maximum temperature.

BLF Bottom Loading Furnaces

Standard features

- ✓ 1700°C & 1800°C maximum operating temperature
- ✓ 3 to 21 litre capacities
- ✓ Ideal for; sintering high performance ceramics, melting glass under high temperature, or working with modified atmospheres
- ✓ Extremely rapid heating & cooling cycles can be achieved through raising & lowering the hearth
- ✓ Electrically operated elevator hearth, protects operator from the chamber's radiant heat & gives easy loading of workpieces & crucibles
- ✓ Excellent temperature uniformity as a result of the round chamber
- ✓ Overtemperature protection to protect load or furnace during unattended operation
- ✓ Programmable 3216P1 controller incorporating over-temperature protection
- ✓ Molybdenum disilicide heating elements



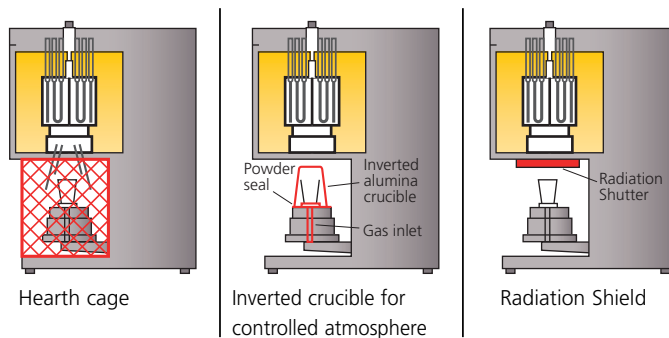
BLF 17/3/3508P1

Options

specify these at time of order

- ✦ Compatible crucibles
- ✦ Modified hearth for the introduction of gases
- ✦ Adaptation to introduce thermocouple or stirrer through the chamber top
- ✦ Rotating hearth option
- ✦ Radiation shutters
- ✦ Hearth cages
- ✦ RS232 & RS485 communications
- ✦ Fieldbus & Ethernet connectivity
- ✦ DAQ or graphical recorders

Rapid heating and cooling are achievable by raising and lowering the hearth, whilst the operator is protected from direct exposure to radiant heat from the chamber.



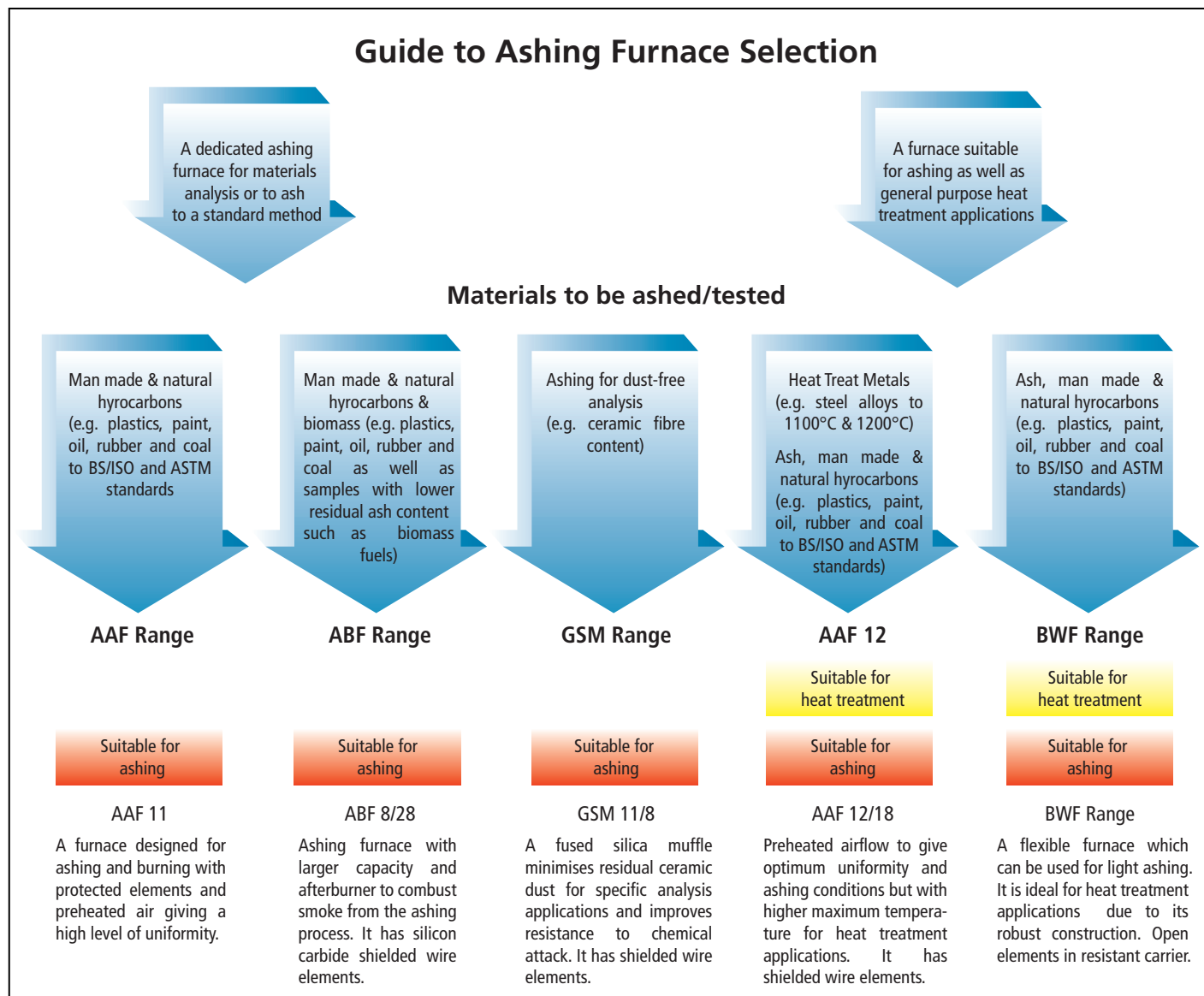
Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal Diameter (mm)	External H x W x D (mm)					
BLF 17/3	1700	80	190 x 150	975 x 750 x 530 Bench mounted	3	4125	B	155	Single
BLF 17/8	1700	80	250 x 200	1950 x 1360 x 800 Floor standing	8	8130	B	424	3 phase
BLF 17/21	1700	180	300 x 300	1850 x 1250 x 850 Floor standing	21	12000	2	600	3 phase
BLF 18/3	1800	110	190 x 150	975 x 750 x 530 Bench mounted	3	4775	2	155	Single phase
BLF 18/8	1800	110	250 x 200	1950 x 1360 x 800 Floor standing	8	7010	2	424	3 phase



Continuous operating temperature is 100°C below maximum temperature.

ASHING & BURN-OFF FURNACES

Introduction to Ashing & Burn-off Furnaces



One of the most common applications for laboratory furnaces is to heat combustible samples in order to analyse the ash residue. There are several important considerations which help to identify the most suitable furnace for the task –

Selecting the Correct Furnace

Because there is no single answer to all of these questions Carbolite offers a range of furnaces with characteristics tailored to ashing and burnoff applications and are always happy to help with selection of the correct furnace.

- Does the ashing process have to conform to a given test method protocol such as those laid down in ISO / ASTM other published standards?
- Does the ashing or burn-off process generate aggressive fumes that could damage the furnace or be hazardous?
- Will the furnace provide an adequate airflow to fully combust the sample?
- How large are the samples which must be heated in order to provide a sufficiently large residue of ash for analysis?
- How intensive is the work cycle and how many samples must be processed?
- Is there a requirement to use the furnace for applications other than ashing or burn-off?
- Would contamination of the ash with traces of alumina or silica (from conventional insulation materials) be detrimental?

AAF Ashing & Burn-off Furnaces

Standard features

- ✓ 1100°C maximum operating temperature
- ✓ Ideal for ashing foods, plastics, coal & other hydrocarbon materials
- ✓ Designed to comply with BS 1016-104.4:1998, ISO 1171:1997, ASTM D2361-02, & ASTM D3174-04
- ✓ Wire elements are protected from chemical & mechanical damage by a hard wearing alumina based liner
- ✓ AAF 11/18 offers increased protection of the elements from carbon & corrosive atmospheres using silicon carbide tiles.
- ✓ Air inlet & tall chimney give airflow from 4 to 5 changes per minute
- ✓ Powerful elements with graded winding compensate for heat loss due to high airflow
- ✓ Preheating of air before it enters the chamber gives excellent uniformity
- ✓ Large floor area allows for large number of samples
- ✓ AAF 11/18 has two tier shelf doubling sample capacity
- ✓ Low chamber height holds airflow close to samples for optimum combustion



AAF 11/7/301

Options

specify these at time of order

- ★ 2 phase electrical supply for AAF 11/7
- ★ Racks & hearth trays as below

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)					
AAF 11/3	1100	140	90 x 150 x 250	585 x 375 x 485 780 height to top of chimney	3	2100 1270	K	22	Single
AAF 11/7	1100	155	90 x 170 x 455	650 x 430 x 740 1060 height to top of chimney	7	4000 2300	K	63	Single / 2 phase
AAF 11/18	1100	70	235 x 196 x 400	705 x 505 x 675 1015 height to top of chimney	18	7080 3500	K	70	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

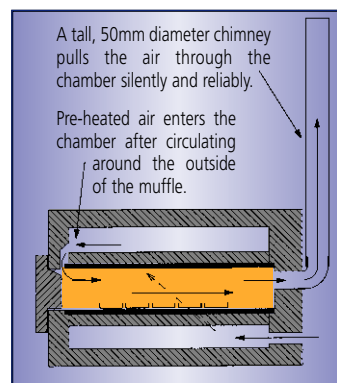
Optional accessories

Model	Sample tray rack system	Inconel sample tray	Perforated sample tray/s	Loading handle
AAF 11/3	✗	✓ *(x1)	✗	✓
AAF 11/7	✗	✓ *(x1)	✗	✓
AAF 11/18	✓	✗	✓ *(x2)	✓

* (number accepted)



TRAYS SUPPLIED WITH FURNACES



ABF Afterburner Ashing Furnace

Standard features

- ✓ 800°C maximum operating temperature – ashing chamber
- ✓ 28 Litre chamber volume
- ✓ Afterburner rated for up to 40g carbon per ashing load
- ✓ 3216P1 Programmable controller
- ✓ Independent control of afterburner temperature up to 950°C
- ✓ Silicon carbide shielded wire wound elements
- ✓ Silicon carbide hearth

Options

specify these at time of order

- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Optional three phase operation
- ✦ Optional floor stand

The ABF 8/28 offers a 28 litre chamber with large floor space and a fan assisted pre-exhaust afterburner to combust smoke before it exits from the chimney.



ABF 8/28

Model	Max temp (°C)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
		Internal H x W x D (mm)	External H x W x D (mm)		Holding power (W)			
ABF 8/28	800	220x350x450	980x600x750	28	8000 3828	K	120	Universal

'Universal' models are easily altered between single phase (220V), 3 phase + neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Holding power is measured at 500°C.

Standard features

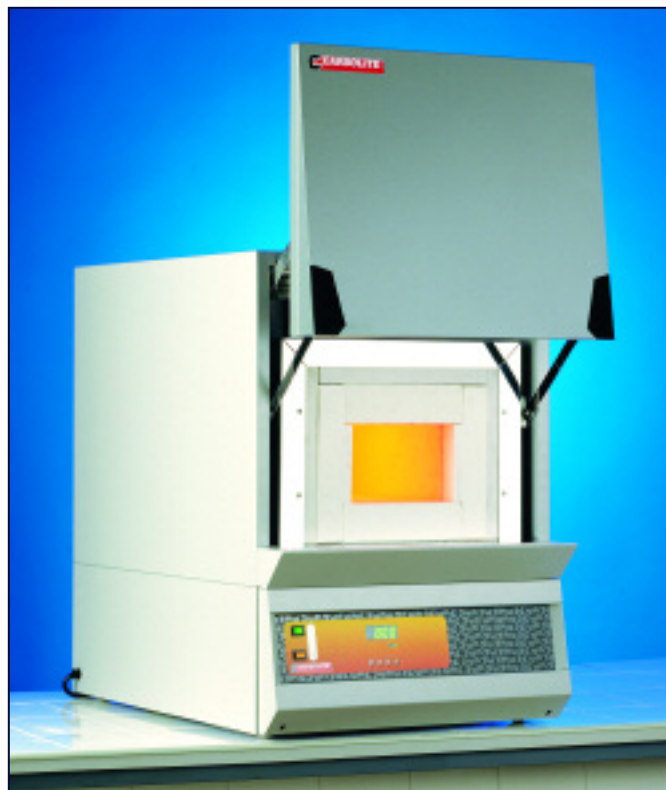
- ✓ 1100°C maximum operating-temperature
- ✓ Fused quartz furnace chamber, ideal for analyses where Al_2O_3 or SiO_2 could contaminate test results
- ✓ Chamber lining offers superior containment of corrosive & aggressive vapours such as H_2SO_4 , HNO_3 , HCl
- ✓ Moulded ceramic fibre door plug

Options

specify these at time of order

- ★ Gas Inlet for modified atmospheres (the fused quartz liner provides improved containment)
- ★ Sample trays & racks as below

For advice on managing corrosive or aggressive materials within your furnace, please contact Carbolite



GSM 11/8

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)					
GSM 11/08	1100	70	120 x 175 x 345	655 x 435 x 740 1060mm height to top of chimney	8	3050 1700	K	57	Single



Continuous operating-temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating-temperature.

Optional accessories

Model	Sample tray rack system	Inconel hearth tray	Inconel sample tray	Perforated sample tray/s	Loading handle
GSM 11/08	✓	✓	✓	✓	✓



ACCESSORY SAMPLE TRAYS & RACK

AAF 12/18 Ashing-Plus Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Ideal for ashing foods, plastics, coal & other hydrocarbon materials
- ✓ Designed to comply with BS 1016-104.4:1998, ISO 1171:1997, ASTM D2361-02, & ASTM D3174-04
- ✓ The higher operating temperature makes this a flexible general purpose furnace also suitable for standards compliant ashing.
- ✓ AAF 12/18 silicon carbide tile protect the elements from carbon & corrosive atmospheres using
- ✓ Air inlet & tall chimney give airflow from 4 to 5 changes per minute
- ✓ Powerful elements with graded winding compensate for heat loss due to high airflow
- ✓ Preheating of air before it enters the chamber gives excellent uniformity
- ✓ Large floor area allows for large number of samples
- ✓ AAF 12/18 has two tier shelf doubling sample capacity
- ✓ Low chamber height holds airflow close to samples for optimum combustion



AAF 12/18

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)		Holding power (W)			
AAF 12/18	1200	70	235 x 196 x 400	705 x 505 x 675 1015 height to top of chimney Bench mounted	18	7080 3500	K	70	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating-temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating-temperature.

Optional accessories

Model	Sample tray rack system	Inconel sample tray	Perforated sample tray/s	Loading handle
AAF 12/18	✓	✗	✓*(x2)	✓



ACCESSORY SAMPLE TRAYS & RACK

Standard features

- ✓ 1100°C or 1200°C maximum operating-temperature
- ✓ Ideal for ashing larger samples or working with non-standard crucibles
- ✓ Good uniformity & compensation for heat loss from graded wire wound elements in side mounted, hard wearing alumina carriers
- ✓ Excellent resilience to wear from refractory brick door surround & hearth
- ✓ Enhanced airflow from high chimney & door vents for full combustion

Options

specify these at time of order

- ✦ Optional 2 phase electrical supply
- ✦ Optional racks & hearth trays as below



BWF 11/13/301

Model	Max temp (°C)	Heat-up time (mins)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Internal H x W x D (mm)	External H x W x D (mm)		Holding power (W)			
BWF 11/13	1100	115	200 x 200 x 325	655 x 435 x 610 800 height to top of chimney	13	3100 1200	K	47	Single
BWF 12/13	1200	130	200 x 200 x 325	655 x 435 x 610 800 height to top of chimney	13	3100 1500	K	47	Single / 2 phase



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

Optional accessories

Model	Sample tray rack system	Inconel hearth tray	Inconel sample tray	Perforated sample tray/s	Loading handle
BWF 11/13	✓	✓	✓	✓	✓
BWF 12/13	✓	✓	✓	✓	✓



ACCESSORY SAMPLE TRAYS & RACK

TUBE FURNACES

Selection of a Tube Furnace

Factors for Selecting a Tube Furnace

- ✦ Tube furnaces are frequently the most economical way to heat a small sample.
- ✦ Rapid temperature changes are possible by simply using a push-rod to move the sample along the length of the tube (although care must be taken not to cause thermal shock to the tube or sample boat).
- ✦ Additionally the work tube makes controlling the temperature uniformity and atmosphere around the specimen much easier.

Temperature

- ✦ We recommend allowing at least 100°C extra heating range above the desired working temperature.
- ✦ The chart below indicates the standard models available and their maximum operating temperatures from 900°C to 1800°C.
- ✦ Different heating technologies are utilised to achieve each given temperature range.

Size & Worktubes

- ✦ Some furnaces, most often those with wire wound elements are supplied with an integral worktube, usually because the resistance wire element is wound directly onto the worktube.
- ✦ For some tube furnaces an accessory worktube is essential.
- ✦ An accessory worktube may be preferred either because of its material properties or to protect (where there is one) the element bearing worktube.
- ✦ See the 'Tube Furnace Options' section for advice on selecting the correct worktube.

Single or Three Zone

- ✦ Tube furnaces provide a high level of uniformity.
- ✦ For improved uniformity accessory end plugs or radiation shields should be purchased, especially for tube diameters > 25mm id.
- ✦ The length of the central uniform zone can be further increased by adding heated zones at the ends in the form of a three-zone furnace design.

Modified Atmosphere or Vacuum

- ✦ Tube furnaces are ideal when the sample must be heated in an inert atmosphere or a vacuum.
- ✦ In this case a combination of end seals protected by thermal radiation shields should be considered.
- ✦ A longer worktube to is required to accommodate these.

Horizontal or Vertical

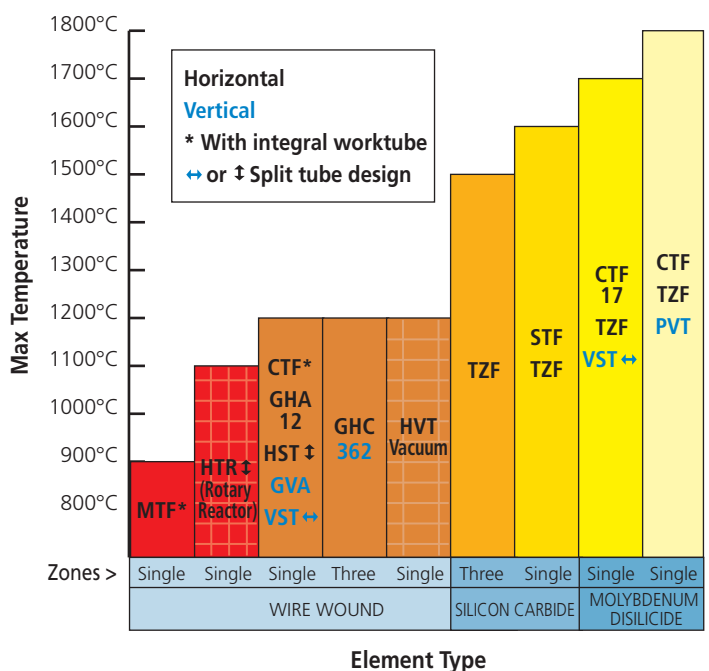
- ✦ Most Carbolite tube furnaces are available in horizontal and vertical configurations.
- ✦ When used vertically, end seals are strongly recommended to minimise the effects of convection currents through the worktube.
- ✦ In vertical configurations the furnace body is separate to the control module and attached by a 2 metre conduit.

Split Tube

- ✦ Both vertical and horizontally configured furnaces are available with the furnace body split and hinged along its length.
- ✦ This enables easy access where worktubes are to be changed between jobs or where the furnace is to be wrapped around the sample for example in tensile test rigs.

Application Specific & Bespoke Designs

Rotary reactor, elevator tube and high vacuum tube furnaces are just some of the standard variations of tube furnace available from Carbolite. Many other bespoke modifications can be provided offering alternative temperature ranges, dimensions, physical configurations, sample handling and functionality such as rotating tubes. Simply contact Carbolite or your local distributor for a quotation.



MTF Wire Wound Single Zone Tube Furnaces

Standard features

- ✓ 900°C, 1000°C or 1200°C maximum operating temperature
- ✓ 15mm, 25mm or 38mm heated tube inner diameters
- ✓ 130mm, 250mm, 400mm or 850mm heated tube length
- ✓ Integral wirewound worktube
- ✓ Control module, with furnace mounted directly on top
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard
- ✓ Horizontal tube configuration



MTF 12/38/250

MTF 10/15/130

Options

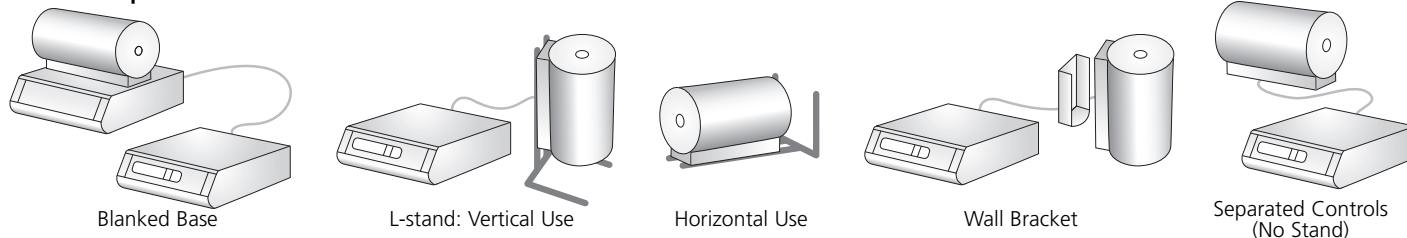
specify these at time of order

- ◆ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ◆ Non-permeable inner worktube to contain modified atmosphere
- ◆ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ◆ Insulation plugs & radiation shields to prevent heat loss & improve uniformity (recommended for vertical use)
- ◆ Gas injection & vacuum compatible tube end seal assemblies



MTF 9/15/130

Stand Options



Model	Max temp (°C)	Heat-up time (mins)	Dimensions			*Uniform length $\pm 5^{\circ}\text{C}$ (mm)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Fixed tube inner diameter (mm)	Heated tube length (mm)	External H x W x D (mm) Furnace body length (mm)					
MTF 9/15/130	900	7	15	130	180 x 90 x 180 180	30	220 100	K	2	Single phase
MTF 10/15/130	1000	5	15	130	265 x 150 x 175 150	30	400 100	K	3	Single phase
MTF 10/25/130	1000	10	25	130	265 x 150 x 175 150	45	400 100	K	3	Single phase
MTF 12/25/250	1200	15	25	250	375 x 370 x 375 300	60	700 200	N	10	Single phase
MTF 12/38/250	1200	25	38	250	375 x 450 x 375 300	90	1000 300	N	15	Single phase
MTF 12/25/400	1200	30	25	400	430 x 370 x 375 450	100	1000 200	N	10	Single phase
MTF 12/38/400	1200	25	38	400	430 x 450 x 375 450	130	1500 300	N	15	Single phase
MTF 12/38/850	1200	–	38	850	430 x 900 x 375 900	600	2800	N	–	Single phase



Continuous operating temperature is 100°C below maximum temperature.

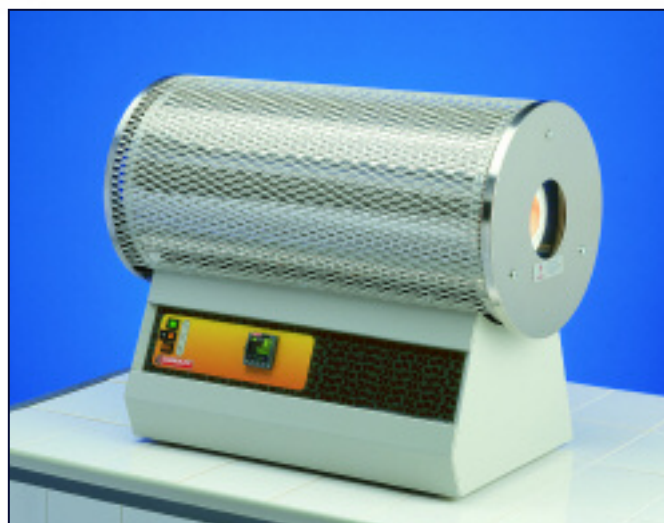
Holding power is measured at the continuous operating temperature.

*Uniform temperature lengths are measured with end plugs fitted.

CTF Wire Wound Single Zone Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ 65mm, 75mm or 100mm worktube inner diameters
- ✓ 550mm, 700mm or 900mm heated tube length
- ✓ Integral wirewound worktube
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard
- ✓ Horizontal tube configuration
- ✓ Horizontal configuration with furnace located on top of controller base



CTF 12/65/550

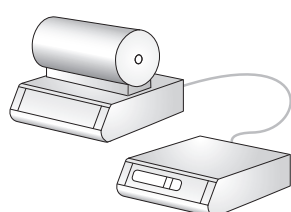
Provides the advantages of a larger diameter and longer worktube than the MTF range, with the option of adding accessory worktubes in order to use modified atmospheres or to protect the wire wound element tube.

Options

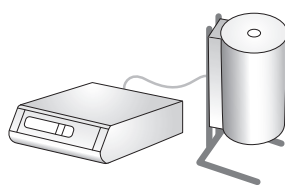
specify these at time of order

- ✦ Alternative 'blank-base' or 'separated-base' configurations
- ✦ Optionally configured for 2 phase electrical supply
- ✦ Non-permeable inner worktube to contain modified atmosphere
- ✦ Range of impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ Gas injection & vacuum compatible tube end seal assemblies
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications & graphical recorders

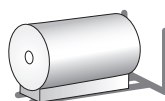
Stand Options



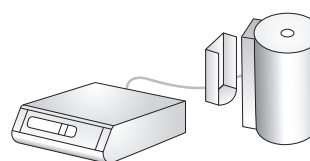
Blanked Base



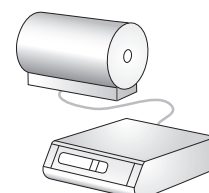
L-stand: Vertical Use



Horizontal Use



Wall Bracket



Separated Controls
(No Stand)

Model	Max temp (°C)	Heat-up time (mins)	Dimensions			*Uniform length ±5°C (mm)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Fixed tube inner diameter (mm)	Heated tube length	External H x W x D (mm)					
					Furnace body length (mm)					
CTF 12/65/550	1200	45	65	550	525 x 625 x 360 600	230	2000	N	25	Single phase or 2 phase
CTF 12/75/700	1200	45	75	700	525 x 775 x 360 750	265	3000	N	28	Single phase or 2 phase
CTF 12/100/900	1200	90	100	900	525 x 975 x 360 950	640	4500	N	35	Single phase or 2 phase



Continuous operating temperature is 100°C below maximum temperature.

*Uniform temperature lengths are measured with end plugs fitted.

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extending beyond the standard length are required when working with modified atmosphere. Radiation shields may also be required.

GHA Single Zone Horizontal Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Accepts worktubes with maximum outer diameters from 20 to 170mm
- ✓ Worktubes with 300, 450, 600, 750, 900, 1050 or 1200mm heated tube length
- ✓ Long life, rapid heating, resistance wire elements mounted in rigid, vacuum formed insulation modules
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard
- ✓ Horizontal configuration
- ✓ Furnace mounted directly on top of controller base unit



GHA 12/75/600/301

Options

specify these at time of order

- ✦ Full range of alternative 'blank-base' & 'separate-base' configurations available
- ✦ Non-permeable inner worktubes to contain modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ Gas injection & vacuum compatible tube end seal assemblies
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications & graphical recorders

A range designed for working using accessory worktubes, whose physical characteristics and chemical resistance can be matched to the specific application.

Requires but does not include an appropriate accessory worktube up to 170mm outer diameter.

Power Supplies for Silicon Carbide Furnaces

The characteristics of the control systems that are used with silicon carbide elements result in maximum power supply requirements that are not as intuitively derived as those for furnaces using other heating technologies. For this reason a more detailed description of the maximum power supply that is required per phase has been included in the specification table.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					*Average uniform length ±5°C (mm)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Max o/d accessory tube (mm)	Tube° / Worktube length (mm)			External H x W x D (mm)					
				Heated°	For work in air	**For modified atmosphere work						
GHA 12/300	1200	90	170	300	500	900	670 x 526 x 468 480	30	2300	N	–	Single or 2 phase
GHA 12/450	1200	97	170	450	650	1050	670 x 676 x 468 630	30	3100	N	37	Single, 3 phase or Universal
GHA 12/600	1200	92	170	600	800	1200	670 x 826 x 468 780	45	3900	N	40	Universal
GHA 12/750	1200	97	170	750	950	1350	670 x 976 x 468 930	60	4600	N	51	Universal
GHA 12/900	1200	–	170	900	1100	1500	670 x 1126 x 468 1080	90	5400	N	55	Universal
GHA 12/1050	1200	83	170	1050	1250	1650	670 x 1276 x 468 1230	100	6200	N	–	Universal
GHA 12/1200	1200	–	170	1200	1400	1800	670 x 1426 x 468 1380	130	7000	N	–	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.

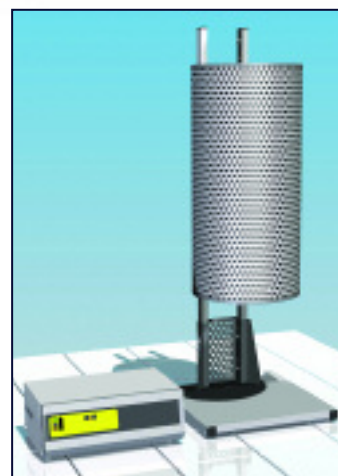
*Average of uniform lengths at 100°C intervals from 800°C to 1200°C, measured with end plugs fitted.

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extending beyond the standard length are required when working with modified atmosphere. Radiation shields may also be required.

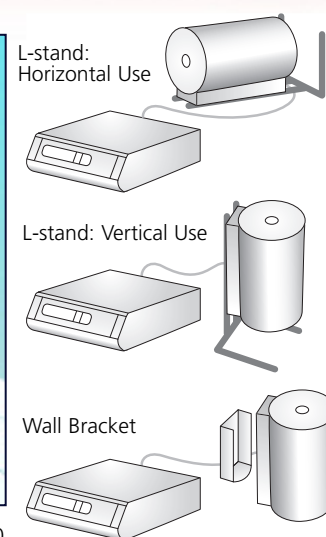
GVA Single Zone Versatile Configuration Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Accepts worktubes with outer diameter of up to 170mm
- ✓ Accepts worktubes with 300, 450, 600, 750, 900, 1050 or 1200mm heated tube length
- ✓ Removable tube adaptors simplify working with different tube diameters
- ✓ Long life, rapid heating, resistance wire elements mounted in rigid, vacuum formed insulation modules
- ✓ Supplied with versatile 'G' stand kit, for free standing horizontal, vertical (adjustable height) or wall mounted installation
- ✓ Control module with 2 metre conduit to furnace cradle
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard



GVA 12/750



Options

specify these at time of order

- ✦ Non-permeable inner worktubes to contain modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Available without stand (comprising control module & furnace body with cradle only)
- ✦ Available without foot (for horizontal mounting or wall mounting using additional bracket)
- ✦ Wall mounting bracket
- ✦ Control module on longer 6 metre conduit

- ✦ 'Blanked-base'
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity (strongly recommended for vertical operation)
- ✦ Gas injection & vacuum compatible tube end seal assemblies
- ✦ 2 phase, 3 phase or 'universal' power supply, depending upon model
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications & graphical recorders

The versatile furnace body and stand design enable operation in a vertical position or mounting onto a test rig or wall bracket with the control model linked the furnace through a two metre (or optionally longer) flexible conduit.

Requires but does not include an appropriate accessory worktube 19.5mm to 170mm outer diameter.

Model	Max temp (°C)	Dimensions						Max power (W)	Thermo-couple type	W't (kg)	Power supply
		Max o/d accessory tube (mm)	Tube* / Worktube length (mm)			External Furnace body (inc stand) H x W x D (mm)	Clearance under furnace (mm)				
			Heated*	For work in air	**For modified atmosphere work						
			Furnace body length (mm)			Control module H x W x D (mm)					
GVA 12/300	1200	170	300 480	500	900	1345 x 468 x 662 222 x 570 x 375	251 to 778	2300	N	–	Single or 2 phase
GVA 12/450	1200	170	450 630	650	1050	1418 x 468 x 662 222 x 570 x 375	177 to 702	3100	N	–	Single, 3 phase or Universal
GVA 12/600	1200	170	600 780	800	1200	1418 x 648 x 662 222 x 570 x 375	177 to 550	3900	N	–	Universal
GVA 12/750	1200	170	750 930	950	1350	1793 x 468 x 662 222 x 570 x 375	177 to 777	4600	N	50	Universal
GVA 12/900	1200	170	900 1080	1100	1500	1860 x 468 x 662 222 x 570 x 375	100 to 702	5400	N	57	Universal
GVA 12/1050	1200	170	1050 1230	1250	1650	1943 x 468 x 662 222 x 570 x 375	26 to 627	6200	N	68	Universal
GVA 12/1200	1200	170	1200 1380	1400	1800	2018 x 468 x 662 222 x 570 x 375	26 to 551	7000	N	–	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extending beyond the standard length are required when working with modified atmospheres. Radiation shields may also be required.

GHC Wire Embedded Three Zone Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Excellent uniformity results from the heated length's division into 3 zones each with its own controller & thermocouple
- ✓ Power to the end zones is automatically adjusted to compensate for heat loss, even without end plugs fitted
- ✓ Provides a longer uniform zone than can be achieved in a single zone tube furnace
- ✓ Heated tube lengths of 450, 600, 750, 900, 1050, or 1380mm
- ✓ Accepts accessory worktubes with inner diameter up to 170mm
- ✓ All three zones are controlled to the same set-point
- ✓ Horizontal configuration with furnace mounted onto control module
- ✓ PID controller with single ramp to setpoint & process timer.



GHC 12/1200

Three zone control provides a considerably longer uniform temperature zone in than is possible with single zone furnaces, however if a programmed controlled cooling ramp is required then specify the 'Retransmission of Setpoint' control option at the time of ordering.

Requires but does not include an appropriate accessory worktube up to 170mm inner diameter.

Options

specify these at time of order

- ✦ End zones of either 150mm or 300mm long
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ Gas injection & vacuum compatible tube end, seal assemblies
- ✦ 8 & 20 segment programmable controllers
- ✦ RS232 communications & graphical recorders
- ✦ 'Retransmission of Setpoint' control configuration to facilitate programmed cooling
- ✦ Alternative furnace sizes can be supplied upon request

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					*Average uniform length ±5°C (mm)	Max power (W)	Thermo-couple type	W't (kg)	Power supply
			Max o/d accessory tube (mm)	Tube• / Worktube length (mm)			External H x W x D (mm)					
				Heated•	For work in air	**For modified atmosphere work			Furnace body length (mm)			
GHC 12/450	1200	98	170	450	750	1050	672 x 676 x 468 630	300	3100 1500	N	6.5	Single phase or Universal
GHC 12/600	1200	64	170	600	900	1200	672 x 827 x 468 780	440	3900 1800	N	40	Universal
GHC 12/750	1200	74	170	750	1050	1350	672 x 976 x 468 930	500	4600 2200	N	40	Universal
GHC 12/900	1200	79	170	900	1200	1500	672 x 1126 x 468 1080	640	5400 2800	N	51	Universal
GHC 12/1050	1200	100	170	1050	1350	1650	672 x 1276 x 468 1230	880	6200 2800	N	55	Universal
GHC 12/1200	1200	–	170	1200	1500	1800	672 x 1426 x 468 1380	–	7000 3100	N	–	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies

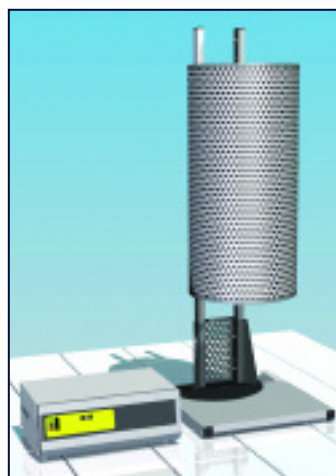


Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.
Uniform length measured with end plugs fitted.

GVC Wire Embedded Versatile Configuration Three Zone Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Excellent uniformity results from the heated length's division into 3 zones each with its own controller & thermocouple
- ✓ Power to the end zones is automatically adjusted to compensate for heat loss
- ✓ Provides a longer uniform zone than can be achieved in a single zone tube furnace
- ✓ Heated lengths of 450, 600, 750, 900, 1050, or 1380mm
- ✓ Accepts accessory work tubes with outer diameters of 110mm or 170mm
- ✓ All three zones are controlled to the same set-point
- ✓ Vertical configuration with separate control module
- ✓ PID controller with single ramp to setpoint & process timer.



GVC 12/750

Options

specify these at time of order

- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Available without stand (comprising control module & furnace body with cradle)
- ✦ Available without foot (for horizontal mounting or wall mounting using additional bracket)
- ✦ Wall mounting bracket
- ✦ Control module on longer 6 metre conduit
- ✦ 'Blank base' mounting option
- ✦ Gas injection & vacuum compatible tube end seal assemblies

- ✦ Insulation plugs & radiation shields are strongly recommended to prevent heat loss & improve uniformity (and are essential for vertical operation)
- ✦ 3 phase or 'universal' power supply, depending upon model
- ✦ 8 or 20 segment programmer
- ✦ 'Retransmission of Setpoint' control configuration to facilitate programmed cooling
- ✦ RS232 communications & graphical recorders
- ✦ Alternative furnace sizes can be supplied upon request

Providing the benefits of a three zone tube furnace in the form of an extended uniform zone together with versatile furnace mounting options and a separate control module linked through a 2 meter flexible conduit.

Requires but does not include an appropriate accessory worktube 170mm outer diameter.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					Clearance under furnace H (mm)	*Average uniform length ±5°C (mm)	Max power (W) Holding power (W)	Thermo-couple type	W't (kg)	Power supply
			Max o/d access-ory tube (mm)	Tube* / Worktube length (mm)			External Furnace H x W x D (mm) Control module H x W x D (mm)						
				Heated*	For work in air	**For modified atmosphere work							
GVC 12/450	1200	75	170	450 630	750	1050	1418 x 468 x 662 222 x 570 x 375	177 to 702	300	3100 1500	N		Single, 3 phase or Universal
GVC 12/600	1200	80	170	600 780	900	1200	1418 x 468 x 662 222 x 570 x 375	177 to 550	440	3900 1800	N		Single phase or Universal
GVC 12/750	1200	92	170	750 930	1050	1350	1793 x 468 x 662 222 x 570 x 375	177 to 777	500	4600 2200	N	50	Single phase or Universal
GVC 12/900	1200	111	170	900 1080	1200	1500	1860 x 468 x 662 222 x 570 x 375	100 to 702	640	5400 2800	N	57	Single phase or Universal
GVC 12/1050	1200	122	170	1050 1230	1350	1650	1943 x 468 x 662 222 x 570 x 375	26 to 627	880	6200 2800	N	68	Single phase or Universal
GVC 12/1200	1200	81	170	1200 1380	1500	1800	2018 x 468 x 662 222 x 570 x 375	26 to 551	–	7000 3100	N	–	Single phase or Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.
Uniform length measured with end plugs fitted.

HST Horizontal Single Zone Split Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Accepts worktubes with outer diameters up to 110mm
- ✓ Accepts worktubes with 200, 300, 400, 600, 900mm heated tube length
- ✓ Furnace splits into two halves to accommodate reactor vessels, large workpieces or samples fixed into a test rig
- ✓ Long life, rapid heating, resistance wire elements mounted in rigid, half cylindrical vacuum formed insulation modules
- ✓ Control module with 2 metre conduit to furnace cradle
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard



HST 12/70/600

Options

specify these at time of order

- ✦ Non-permeable inner worktubes and end seal assemblies for modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Available with 'L' stand kit for vertical or horizontal use
- ✦ Wall mounting bracket
- ✦ Control module on longer 6 metre conduit
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ 2 phase, 3 phase or 'universal' power supply, depending upon model

- ✦ 8 or 20 segment programmer
- ✦ RS232 communications & graphical recorders

The flexibility of using accessory work tubes that are matched to the application and the convenience of a split design for easy insertion of long samples or worktubes.

Requires but does not include an appropriate accessory worktube 19.5mm to 110mm outer diameter.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					*Average uniform length ±5°C (mm)	Max power (W)	Thermo-couple type	W't (kg)	Power supply
			Max o/d accessory tube (mm)	Tube* / Worktube length (mm)			External Furnace (inc stand) H x W x D (mm)					
				Heated*	For work in air	**For modified atmosphere work						
				Furnace body length (mm)								
HST 12/200	1200	45	110	200 350	350	650	350 x 325 x 410 222 x 570 x 375	100	1000	N	26	Single or 2 phase
HST 12/300	1200	45	110	300 450	450	750	350 x 425 x 410 222 x 570 x 375	150	1500	N	28	Single, 3 phase or Universal
HST 12/400	1200	45	110	400 550	550	850	350 x 525 x 410 222 x 570 x 375	200	2000	N	32	Universal
HST 12/600	1200	45	110	600 750	750	1050	350 x 725 x 410 222 x 570 x 375	300	3000	N	38	Universal
HST 12/900	1200	45	110	900 1050	1050	1350	350 x 1025 x 410 222 x 570 x 375	450	4500	N	60	Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.

*Average of uniform lengths at 100°C intervals from 800°C to 1200°C, measured with end plugs fitted.

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extended beyond the standard length are required when working with modified atmospheres. Radiation shields may also be required.

VST Vertical Single Zone Split Tube Furnaces

Standard features

- ✓ 1200°C Maximum operating temperature
- ✓ Accepts worktubes with inner diameters up to 110mm
- ✓ Accepts worktubes with 200, 300, 400, 600, 900mm heated length
- ✓ Furnace hinges into two halves to accommodate reactor vessels, large workpieces or samples fixed into a test rig
- ✓ Long life, rapid heating resistance wire elements mounted in rigid, half cylindrical vacuum formed insulation modules
- ✓ Supplied in 'near-hinge' configuration complete with stand
- ✓ Control module with 2 metre conduit to furnace cradle
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard



VST 12/600/3508P1 (near hinge)

- ✦ 8 or 20 segment programmer
- ✦ RS232 communications & graphical recorders

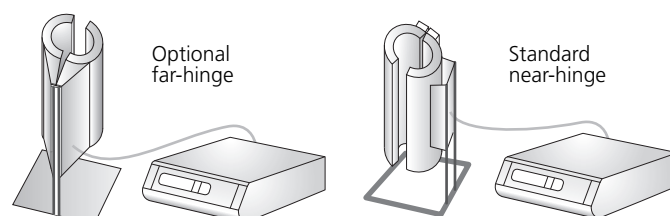
Options

specify these at time of order

- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ 'Far-hinge' configuration providing wider opening of furnace body
- ✦ Non-permeable inner worktubes to contain modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Control module on longer 6 metre conduit
- ✦ Gas injection & vacuum compatible tube end seal assemblies
- ✦ 3 phase or 'universal' power supply, depending upon model

The free standing vertical design is ideal for wrap around heating applications such as extension test rigs or vertical reaction tubes. The 'far hinge' option opens wider for greater flexibility in application.

Usually requires but does not include an appropriate accessory worktube 19.5mm to 110mm outer diameter. End plugs are strongly recommended when using vertical tube furnaces.



Model	Max temp (°C)	Heat-up time (mins)	Dimensions					Max power (W)	Thermo-couple type	W't (kg)	Power supply
			Max o/d accessory tube (mm)	Tube * / Worktube length (mm)			External Furnace (inc stand)				
				Heated*	For work in air	**For modified atmosphere work		H x W x D (mm) Base H x W x D (mm)			
				Furnace body length (mm)			Holding power (W)				
VST 12/200	1200	45	110 350	200 350	500	800	300 x 350 x 350 222 x 570 x 375	1000 800	N	24	Single
VST 12/300	1200	45	110 450	300 450	600	900	400 x 350 x 350 222 x 570 x 375	1500	N	25	Single
VST 12/400	1200	45	110 550	400 550	700	1000	500 x 350 x 350 222 x 570 x 375	2000 900	N	26	Single
VST 12/600	1200	45	110 750	600 750	900	1200	700 x 350 x 350 222 x 570 x 375	3000 1100	N	32	Single, 3 phase or Universal
VST 12/900	1200	45	110 1050	900 1050	1200	1500	1000 x 350 x 350 222 x 570 x 375	4500	N	44	Single, 3 phase or Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

*Average of uniform length measured with end plugs fitted.

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extending beyond the standard length are required when working with modified atmospheres. Radiation shields may also be required.

TZF Wire Wound Horizontal Three Zone Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperatures
- ✓ Excellent uniformity results from division of the heated length into 3 equal zones each with its own controller & thermocouple.
- ✓ Provides a longer uniform zone than can be achieved in single zone tube furnace
- ✓ Power to the end zones is automatically adjusted to compensate for heat loss
- ✓ All three zones are controlled to the same set-point
- ✓ Heated lengths of 400, 550, 700 or 900mm
- ✓ Models accepting worktubes with inner diameters of 38mm to 90mm
- ✓ Horizontally mounted on control module base



TZF 12/75/700/3216P1

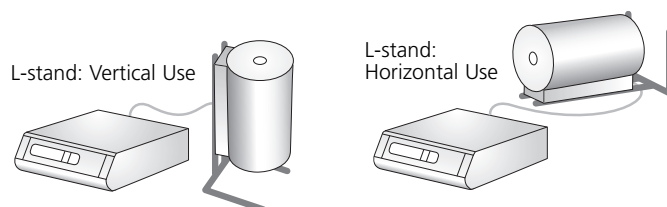
Options

specify these at time of order

- ✦ Shorter end zone option to provide extended uniform length (optionally in 2 phase configuration)
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ Gas injection & vacuum compatible, worktube end seal assemblies
- ✦ Separate control module on 2 metre or 6 metre conduit
- ✦ 'L' style flexible stand option for vertical or independent mounting
- ✦ 8 or 20 segment programmer
- ✦ 'Retransmission of Setpoint' zone control configuration for programmed cooling
- ✦ RS232 communications & graphical recorders
- ✦ Alternative furnace sizes can be supplied upon request

Comprising an horizontal furnace body with three zone wire wound worktube element that is equipped as standard with 'Back to Back' zone control. It can be used directly or with accessory worktubes.

Usually requires but does not include an appropriate worktube of up to 90mm maximum outer diameter.



Model	Max temp (°C)	Heat-up time (mins)	Dimensions				*Uniform length ±5°C (mm)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Max o/d accessory tube (mm)	Heated tube length (mm)	Overall furnace length (mm)	External H x W x D (mm)					
						Furnace body length (mm)					
TZF 12/38/400	1200	25	38	400	450	430 x 450 x 375 450	305	1175 700	N	32	Single
TZF 12/65/550	1200	45	65	550	600	525 x 625 x 360 600	390	1817 600	N	38	Single 3 phase
TZF 12/75/700	1200	45	90	700	750	525 x 775 x 360 750	540	2755 800	N	46	Single 3 phase
TZF 12/100/900	1200	120	90	900	950	525 x 975 x 360 950	754	4150 1000	N	54	Single or Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

Uniform length measured with end plugs fitted.

EVT Elevator Tube Furnaces

Standard features

- ✓ 1200°C Maximum operating temperature
- ✓ Integral 100mm inner diameter x 400mm long, plasma sprayed IAP worktube
- ✓ Furnace body rises and lowers on electrically driven slide mechanism
- ✓ Fixed position sample holder
- ✓ 20 segment programmable control as standard
- ✓ Over-temperature protection as standard
- ✓ Long life, rapid heating, 1100°C resistance wire elements mounted in rigid, vacuum formed insulation modules
- ✓ Furnace body mounted on integral floor / bench stand.
- ✓ Stand alone control module with 2 metre conduit



EVT 11/100/400

Options

specify these at time of order

- ✦ Inert gas purging system
- ✦ 3 phase power supply
- ✦ RS232 communications & graphical recorders

Designed specifically for applications where the test sample must be disturbed as little as possible whilst being introduced into the furnace. As an additional option the furnace can be fitted with an inert gas purging system to supply cooling air or inert gas into the tube as preset intervals.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					Max power (W)	Thermo-couple type	W't (kg)	Power supply
			Max i/d accessory tube (mm)	Tube* / Worktube length (mm)			External Furnace (inc stand) H x W x D (mm)				
				Heated*	For work in air	**For modified atmosphere work					
							Holding power (W)				
EVT 11/100/400	1100		100	400	400	400	1200 x 800 x 600 900 x 600 x 500		R	-	Single



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

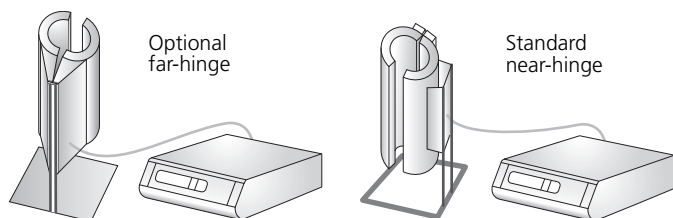
HZS & TVS Wire Embedded Versatile Configuration Three Zone Split Tube Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Accepts accessory worktubes with maximum outer diameters up to 110mm
- ✓ Heated tube length 600mm or 900mm
- ✓ Versatile horizontal (HZS) or vertical (TVS) configuration furnaces with separate control module on 2 metre conduit
- ✓ Furnace splits into two halves to accommodate reactor vessels, large workpieces or samples fixed into a test rig
- ✓ Long life, rapid heating, resistance wire elements mounted in rigid, half cylindrical vacuum formed insulation modules
- ✓ Carbolite 301 controller, with single ramp to set-point facility with two back to back 2132 controllers
- ✓ Delayed start / process timer function as standard



TVS 12/600/3216P (near hinge)



Options

specify these at time of order

- ★ With end zones either 150mm long or with three approximately equal length zones
- ★ Insulation plugs & radiation shields to prevent heat loss & improve uniformity (strongly recommended for vertical tubes)
- ★ Non-permeable inner worktubes to contain modified atmosphere
- ★ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ★ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ★ Available with 'L' stand kit for vertical or horizontal use

- ★ Wall mounting bracket
- ★ 'Far-hinge' configuration alternatives for the vertical TVS range
- ★ Control module on longer 6 metre conduit
- ★ Gas injection & vacuum compatible tube end seal assemblies
- ★ 3 phase or 'universal' power supply
- ★ 8 or 20 segment programmer
- ★ RS232 communications & graphical recorders

Ranges of horizontal (HZS) and vertical (TVS) three zone split tube furnaces heated using wire wound elements. These offer the advantages of increased uniform heated length, and a furnace body capable of versatile horizontal, vertical or 'L' stand mounting.

Requires but does not include an appropriate accessory worktube up to 110mm outer diameter.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					*Average uniform length ±5°C (mm)	Max power (W) Holding power (W)	Thermo-couple type	W't (kg)	Power supply
			Max o/d accessory tube (mm)	Tube* / Worktube length (mm)			External Furnace H x W x D (mm) Control module H x W x D (mm)					
				Heated* Furnace body length (mm)	For work in air	**For modified atmosphere work						
HZS 12/600	1200	45	110	600 750	900	1200	350 x 725 x 410 222 x 570 x 375	500	3000 —	N	40	3 phase or Universal
HZS 12/900	1200	45	110	900 1050	1200	1500	350 x 1050 x 410 222 x 570 x 375	750	4500 1100	N	65	3 phase or Universal
TVS 12/600	1200	45	110	600 750	600	750	700 x 350 x 350 222 x 570 x 375	500	3000 —	N	34	3 phase or Universal
TVS 12/900	1200	45	110	900 1050	1200	1050	1000 x 350 x 350 222 x 570 x 375	750	4500 —	N	44	3 phase or Universal

'Universal' models are easily altered between single phase (220V), 3 phase+neutral (e.g. 380/220V) and delta (e.g. 220V) electrical supplies



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

Uniform length measured with end plugs fitted.

STF High Temperature Single Zone Tube Furnaces

Standard features

- ✓ 1500°C & 1600°C maximum operating temperatures
- ✓ Using worktubes of 60 or 90mm outer diameter
- ✓ Accepts worktubes with 180, 450 or 610mm heated tube length
- ✓ Silicon carbide heating elements
- ✓ Horizontal configuration
- ✓ Carbolite 301 controller, with single ramp to set-point facility
- ✓ Delayed start / process timer function as standard

Options

specify these at time of order

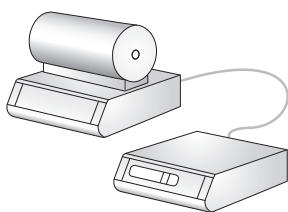
- ✦ Available with 'L' stand kit or wall bracket for vertical or horizontal use
- ✦ Available in 'Blank-stand' or 'Separate-stand' configurations
- ✦ Non-permeable inner worktubes to contain modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity-recommended for vertical tubes
- ✦ Gas injection & vacuum compatible tube end, seal assemblies
- ✦ 3 Phase or 'universal' power supply, depending upon model
- ✦ 8 or 20 Segment programmer
- ✦ RS232 communications & graphical recorders



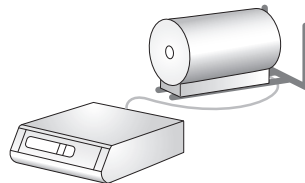
STF 15/180/301 (L STAND OPTION)

A range of tube furnaces offering the higher temperatures that are available from silicon carbide heating elements, with the additional option of a vertical 'L' stand and separate controller if preferred. The user must select an accessory worktube specific to their application.

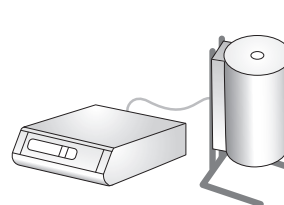
Requires but does not include an appropriate accessory worktube 19.5mm to either 60mm or 90mm inner diameter.



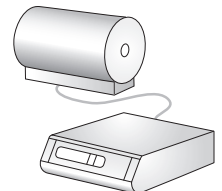
Blanked Base



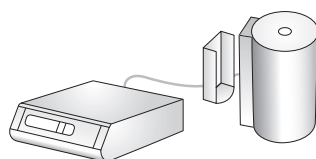
L-stand: Horizontal Use



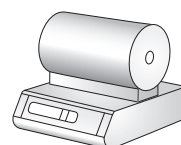
L-stand: Vertical Use



Separated Controls
(No Stand)



Wall Bracket



Normal Construction
(Horizontal)

STF High Temperature Single Zone Tube Furnaces

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					Uni-form length ±5°C (mm)	Max power (W)	T/C type	W't (kg)	Power supply required per phase
			Max o/d access-ory tube (mm)	Tube* / Worktube length (mm)			External H x W x D (mm)					
				Heated*	For work in air	**For modified atmosphere work			Furnace body length (mm)			
STF 15/180	1500	Rate will vary with state of oxidation and age of elements	60	180	180	480	500 x 600 x 375 600	80	1500	R	29	<i>a1</i> =12A, <i>d1</i> =24A
STF 15/450	1500		90	450	450	750	660 x 830 x 445 900	350	5500 3800	R	34	<i>a1</i> =39A, <i>a2</i> =19.5A, <i>c3</i> =25A
STF 15/610	1500		90	610	610	910	660 x 1130 x 445 1200	400	6000 4200	R	45	<i>a1</i> =32A, <i>b1</i> =44A, <i>a2</i> =19.5A, <i>f3</i> =19.5A <i>a3</i> =34A
STF 16/180	1600		60	180	180	480	500 x 600 x 375 600	80	2500 →	R	29	<i>a1</i> =23A
STF 16/450	1600		90	450	450	750	660 x 830 x 445 900	350	6000 →	R	40	<i>a1</i> =47A, <i>a2</i> =24A, <i>h3</i> =21A, <i>a3</i> =39A, <i>g3</i> =21A
STF 16/610	1600		90	610	610	910	660 x 1130 x 445 1200	400	7000 →	R	50	<i>a1</i> =50A, <i>a2</i> =25A, <i>h3</i> =25A, <i>i3</i> =27A, <i>d3</i> =43A, <i>e3</i> =46A
<i>a1</i> =Single 200-240V, <i>d1</i> =Single 110-120V, <i>a2</i> =380-415V 2 phase + N, <i>a3</i> =200-240V 3 phase delta, <i>d3</i> =200-220V 3 phase delta, <i>e3</i> =230-240V 3 phase delta, <i>g3</i> =380-415V 3 phase no N, <i>h3</i> =380-415V 3 phase + N, <i>i3</i> =400-415 3 phase + N												



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

Uniform length measured with end plugs fitted.

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extending beyond the standard length are required when working with modified atmospheres. Radiation shields may also be required.

VST Vertical Single Zone Split Tube Furnaces

Standard features

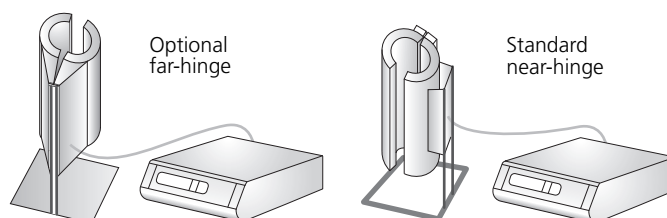
- ✓ 1700°C Maximum operating temperature
- ✓ Accepts worktubes with heated tube length to 250mm
- ✓ Furnace splits into two halves to accommodate reactor vessels, large workpieces or samples fixed into a test rig
- ✓ Molybdenum disilicide elements to 1700°C
- ✓ Supplied in 'near-hinge' configuration complete with stand
- ✓ Control module with 2m conduit to furnace cradle
- ✓ Carbolite 3216P1 controller with 16 paired segment programmability
- ✓ Over-temperature protection, from secondary controller



VST 17/250

The free standing vertical design is ideal for wrap around heating applications such as extension test rigs or vertical reaction tubes. Two hinge designs ('near hinge' or 'far-hinge') provide a wider opening furnace body and hence even more application flexibility.

Usually requires but does not include an appropriate accessory worktube 90mm outer diameter.



Options

specify these at time of order

- ✦ 'Far-hinge' configuration providing wider opening of furnace body
- ✦ Non permeable inner worktubes to contain modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Control module on longer 6m conduit
- ✦ Insulation plugs & radiation shields very strongly recommended for high temperature vertical tube furnaces to prevent heat loss & improve uniformity.
- ✦ Gas injection & vacuum compatible tube end seal assemblies
- ✦ 20 segment programmer
- ✦ RS232 Communications & graphical recorders

Model	Max temp (°C)	Heat-up time (mins)	Dimensions					Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Max o/d accessory tube (mm)	Tube* / Worktube length (mm)			External Furnace (inc stand) H x W x D (mm) Base H x W x D (mm)				
				Heated*	For work in air	**For modified atmosphere work					
VST 17/250	1700	–	90	900	550	850	350 x 1025 x 410 222 x 570 x 375	4500	B	–	3 phase



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

*Average of uniform length measured with end plugs fitted

** To ensure tube end temperatures that are compatible with sealing assemblies, worktubes extending beyond the standard length are required when working with modified atmospheres. Radiation shields may also be required.

CTF High Temperature Horizontal Tube Furnaces

Standard features

- ✓ 1700°C & 1800°C maximum operating temperature
- ✓ Utilising molybdenum disilicide elements
- ✓ Using worktubes with inner diameters of up to 90mm
- ✓ Accepts worktubes with 300mm or 600mm heated tube length
- ✓ Horizontal configuration
- ✓ 8 Segment programmable controller incorporating over-temperature protection

Options

specify these at time of order

- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ Gas injection & vacuum compatible worktube end, seal assemblies
- ✦ Tube supports essential for use with high vacuum seals
- ✦ 2 phase or 3 phase or power supply
- ✦ 20 segment programmer
- ✦ RS232 communications & graphical recorders
- ✦ Alternative furnace sizes can be supplied upon request



CTF 17/75/300/3216P1

Designed for high temperature applications utilising high temperature RCA (recrystallised alumina) worktubes. Vertical elements heat an horizontal tube.

Requires but does not include an appropriate RCA (recrystallised alumina) accessory worktube 19.5mm to 90mm maximum outer diameter.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions				Uniform length ±5°C (mm)	Max power (W) Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
			Max o/d accessory tube (mm)	Heated tube length (mm)	Overall furnace length (mm)	External H x W x D (mm)					
						Furnace body length (mm)					
CTF 17/300	1700	Rate will vary with state of oxidation and age of elements	90	300	650	755 x 600 x 555 650	200	4125 2500	B	126	Single, 2 or 3 phase
CTF 17/600	1700		90	600	950	900 x 950 x 630 950	400	6875 3800	B	220	Single, 2 or 3 phase
CTF 18/300	1800		90	300	650	755 x 600 x 555 650	200	5200	2 [‡]	130	Single, 2 or 3 phase
CTF 18/600	1800		90	600	950	755 x 900 x 555 950	400	5700	2 [‡]	230	Single, 2 or 3 phase



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

Uniform length measured with end plugs fitted.

[‡]A Carbolite proprietary thermocouple design.

PVT High Temperature Vertical Tube Furnaces

Standard features

- ✓ 1800°C maximum operating temperature
- ✓ Utilising lanthanum chromite elements (these generally achieve slower heating rates than other element materials)
- ✓ Using worktubes with maximum outer diameters of 60, 90, 115 or 140mm
- ✓ Accepts worktubes with 200mm or 350mm heated tube length
- ✓ Vertical (only) configuration using the 'L' stand assembly
- ✓ Separate control module on 2 metre conduit
- ✓ 8 Segment programmable controller incorporating over-temperature protection



PVT 18/125/350

Options

specify these at time of order

- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity (strongly recommended for vertical tubes)
- ✦ Gas injection & vacuum compatible tube end, seal assemblies
- ✦ 20 segment programmer
- ✦ RS232 communications & graphical recorders
- ✦ Alternative furnace sizes can be supplied upon request

For slower heating, high temperature applications requiring a vertically orientated tube furnace body, which accepts RCA (recrystallised alumina) accessory worktubes.

Requires but does not include an appropriate RCA (recrystallised alumina) accessory worktube 19.5mm to either 60mm, 90mm, 115mm or 140mm outer diameter.

Note: Lanthanum chromite elements may give off small amounts of chromium vapour in use, which can cause contamination or slight pink colouration when work is done without use of a worktube.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions				Max power (W)	Thermo-couple type	Weight (kg)	Power supply
			Max o/d accessory tube (mm)	Heated tube length (mm)	External Furnace	Furnace body				
					H x W x D (mm)	length (mm)	Holding power (W)			
PVT 18/50/200	1800	Rate will vary with state of oxidation and age of elements	60	200	850 x 700 x 810 222 x 570 x 375	-	5500 4000	2 [‡]	270	2 phase or 3 phase
PVT 18/75/350	1800		90	350	1000 x 700 x 810 222 x 570 x 375	-	9000 5000	2 [‡]	300	3 phase
PVT 18/100/350	1800		115	350	1000 x 700 x 810 222 x 570 x 375	-	6000 5000	2 [‡]	400	3 phase
PVT 18/125/350	1800		140	350	1000 x 700 x 810 222 x 570 x 375	-	9300 7000	2 [‡]	500	3 phase



Continuous operating temperature is 100°C below maximum temperature.

Holding power is measured at the continuous operating temperature.

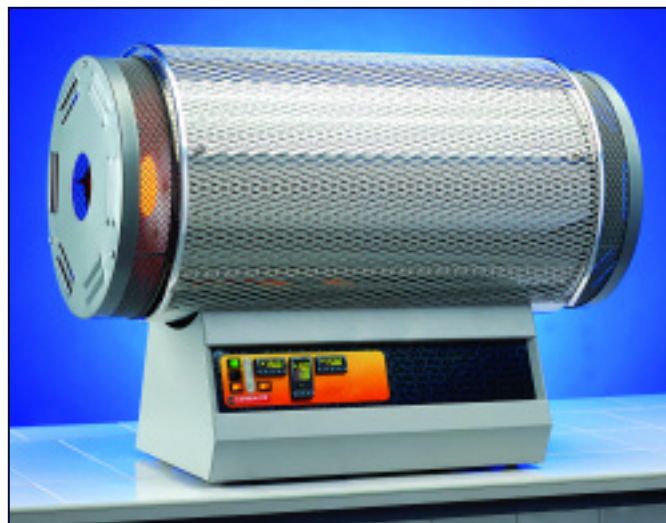
Uniform length measured with end plugs fitted.

[‡]A Carbolite proprietary thermocouple design.

TZF High Temperature Three Zone Horizontal Tube Furnaces

Standard features

- ✓ 1800°C maximum operating temperature
- ✓ Accepts worktubes with outer diameters of up to 110mm
- ✓ Worktubes with 600 or 610mm heated tube length
- ✓ Includes end-zone controller using "back to back" control configuration
- ✓ Carbolite 301 controller with simple ramp to set points facility (TZF 15 & TZF 16)
- ✓ 8 segment programmable temperature control (TZF 17 & TZF 18)
- ✓ Overtemperature protection (TZF 17 & TZF 18)
- ✓ Delayed start / process timer function as standard



TZF 15/610

Options

specify these at time of order

- ✦ Non-permeable inner worktubes to contain modified atmosphere
- ✦ Impervious inner worktubes to protect against chemical attack or damage from thermal shock
- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation) (TZF 15 & TZF 16)
- ✦ Insulation plugs & radiation shields to prevent heat loss & improve uniformity
- ✦ Control module with 2 metre conduit to furnace cradle
- ✦ Gas injection & vacuum compatible tube end seal assemblies
- ✦ 2 phase, 3 phase or 'universal' power supply, depending upon model
- ✦ 20 segment programmer
- ✦ RS232 communications & graphical recorders
- ✦ 'Retransmission of Setpoint' control configuration to facilitate programmed cooling

Range of silicon carbide & molybdenum disilicide heated three zone furnaces supplied with 'Back to Back' controls as standard. Where programmed cooling rates are required or the option of vertical orientation is chosen then 'Retransmission of Setpoint' control should be requested at time of order.

Requires but does not include an appropriate accessory worktube up to 110mm outer diameter.

Note: 1700°C or 1800°C furnaces have case configuration similar to the CTF series.

Model	Max temp (°C)	Heat-up time (mins)	Dimensions				Max power (W)	T/C type	W't (kg)	Power supply required per phase	
			Max o/d accessory tube (mm)	Tube* / Worktube length (mm)							External H x W x D (mm)
				Heated*	For work in air	**For modified atmosphere work	Holding power (W)				
TZF 15/610	1500	75	110	610	900	1650	660 x 1130 x 445	8000 4000	R	44	<i>a1</i> =60A, <i>h3</i> =22A, <i>e3</i> =38A
TZF 16/610	1600	–	110	610	900	1500	660 x 1130 x 445	9150 4500	R	44	<i>c1</i> =62A, <i>h3</i> =25A, <i>e3</i> =40A
TZF 17/600	1700	150	110	600	1200	1500	900 x 950 x 630	9000 3800	B	180	<i>a1</i> =46A, <i>b1</i> =48A, <i>h3</i> =28A, <i>e3</i> =34A,
TZF 18/900	1800	150	110	600	1200	1500	945 x 1020 x 740	9300	2 [‡]	44	<i>a1</i> =40A, <i>b3</i> =30A, <i>e3</i> =28A, <i>h3</i> =24A
<i>a1</i> =Single 200-240V, <i>b1</i> =200-208V, <i>c1</i> = Single 220-240V, <i>d3</i> =200-220V 3 phase delta, <i>e3</i> =230-240V 3 phase delta, <i>h3</i> =380-415V 3 phase + N											



Continuous operating temperature is 100°C below maximum temperature.

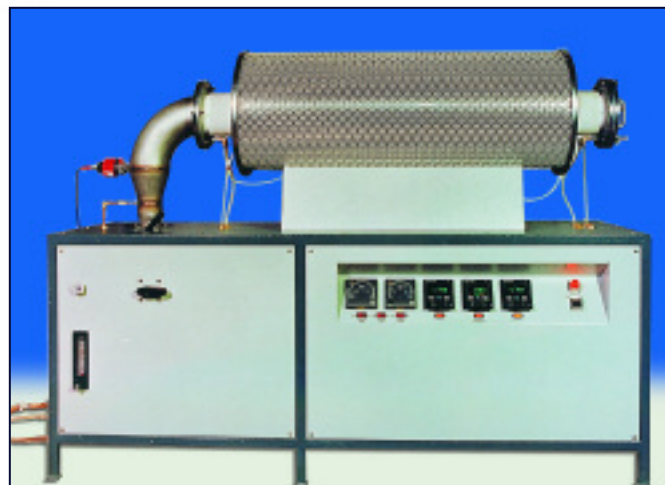
Uniform length measured with end plugs fitted.

[‡]A Carbolite proprietary thermocouple design.

HVT High Vacuum Tube Furnaces

Standard features

- ✓ 1200°C & 1500°C maximum operating temperature
- ✓ Capable of 10^{-5} mbar vacuum in clean empty worktube.
- ✓ Complete with worktube with inner diameters of either 50, 60, 80 or 75mm
- ✓ Worktube with heated lengths of 450mm, 550mm or 700mm
- ✓ Vacuum provided by two stage rotary sliding vane pump & turbo-molecular pump
- ✓ Manually operated roughing / backing baffle valve
- ✓ Pirani gauge low vacuum monitor
- ✓ Penning gauge high vacuum monitor
- ✓ Worktube connects to the vacuum system via 90° stainless steel radiused connection
- ✓ Access to the worktube is via removable stainless steel vacuum flange
- ✓ Radiation shields at both ends of worktube maintain uniformity without reducing pump speeds
- ✓ The vacuum system & all controls are mounted within the base unit



HVT

A range of 5 standard units capable of high vacuum operation which also form a base from which bespoke customer designs can be developed in order to meet specific application requirements.

Options

specify these at time of order

- ✦ Overtemperature protection (recommended in all cases of unattended operation or where valuable samples are to be processed)
- ✦ Vertical configurations also available
- ✦ A variety of gas backfill systems are available
- ✦ Additional safety systems for use with combustible atmospheres
- ✦ Automatic & semi-automatic vacuum systems
- ✦ Air or water cooled diffusion pump
- ✦ Cooling water failure alarm
- ✦ Three zone control for even better uniformity
- ✦ Special vertical & custom build configurations
- ✦ 8 or 20 segment programmer
- ✦ RS232/RS484 communications & graphical recorders

Model	Max temp (°C)	Dimensions			Max power (W)	Thermo-couple type	Weight (kg)	Power supply required per phase
		Worktube inner diameter (mm)	Heated tube length (mm)	External Furnace H x W x D (mm)				
HVT 12/50/550	1200	50	550	1450 x 1700 x 600	2000 1600	N	–	<i>c1</i> =14.5A
HVT 12/60/700	1200	60	700	1450 x 1700 x 600	3000 1800	N	–	<i>c1</i> =18.5A
HVT 12/80/700	1200	80	700	1450 x 1700 x 600	3500 2800	N	–	<i>c1</i> =21A
HVT 15/50/450	1500	50	450	1565 x 1700 x 600	5500 4800	R	–	<i>c1</i> =45A, <i>a2</i> =26A
HVT 15/75/450	1500	75	450	1565 x 1700 x 600	5500 4800	R	–	<i>c1</i> =45A, <i>a2</i> =26A
<i>c1</i> =220-240V, <i>a2</i> =380-415 2 phase + N								

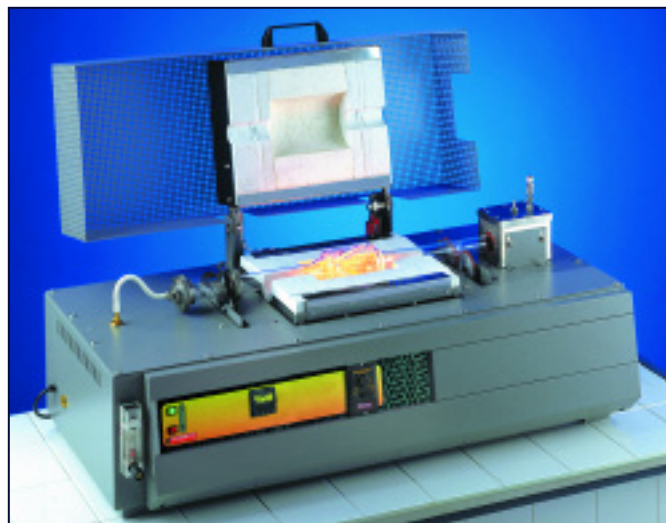


Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

HTR Rotary Reactor Furnaces

Standard features

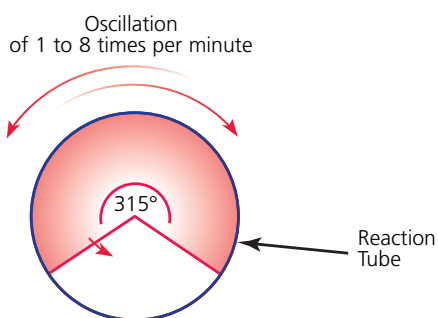
- ✓ 1100°C maximum operating temperature
- ✓ Developed in partnership with the Imperial College of Science & Technology, London
- ✓ Digital PID temperature control
- ✓ Heating is provided by long life, rapid heating, resistance wire elements mounted in rigid, half cylindrical vacuum formed insulation modules
- ✓ The fluted internal surface of the reactor ensures good mixing as the variable speed electric drive system oscillates the reactor tube
- ✓ A positive break safety interlock switch cuts power to the elements when the heating chamber is open
- ✓ Gas enters the reactor through a flexible silicon rubber tube
- ✓ A 30mm flow meter calibrated for Nitrogen is provided
- ✓ A single seal gasket directs the reactor exhaust into a removable stainless steel exhaust box from where a gas outlet would enable piping to an extraction system



HTR 11/75

These furnaces combine many of the advantages of fluidised bed reactors with those of a rotary kiln. The sample can be simultaneously heated and agitated under a controlled atmosphere. A process which overcomes the long reaction times required when using conventional muffle furnaces or static tube under a flowing atmosphere.

Includes fused quartz reaction vessel.



Options

specify these at time of order

- ✦ Over-temperature protection (recommended in all cases of unattended operation or where valuable samples are to be processed)
- ✦ Single or multiple flow meters calibrated for different gases are available
- ✦ 8 or 20 segment programmer
- ✦ RS232 communications & graphical recorders

Applications

- ✓ Applications in lab scale calcination of materials
- ✓ Calcining arsenical gold ores under neutral atmospheres to remove sulphur & arsenic
- ✓ Analysis of sulphur ores in metallurgical slags
- ✓ Operation as a low temperature rotary reactor furnace to remove organic solvent from oxide pigment materials
- ✓ Roasting sulphide ores to convert them to oxides
- ✓ Determination of silica content in rice husks
- ✓ Low temperature calcination of limestone & dolomite
- ✓ Calcining colliery spoils at upto 1000°C

Model	Max temp (°C)	Heat-up time (mins)	Dimensions				Max power Holding power (W)	Thermo-couple type	Weight (kg)	Power supply
		Cooling time with lid open (mins)	Reaction chamber dimensions (mm) & Capacity	Oscillation frequency per min	Rotation in each direction	External H x W x D (mm) Lid up Lid down				
HTR 11/75	1100	11 15	75 x 100 50ml	1 to 8	315°	480 x 1140 x 550 800 x 1140 x 680	1500 400	K	40	Single
HTR 11/50	1100	21 15	150 x 200 700ml	1 to 8	315°	540 x 1300 x 900 950 x 1300 x 900	3000 1000	K	95	Single



Continuous operating temperature is 100°C below maximum temperature.
Holding power is measured at the continuous operating temperature.

SPTF Rotating Tube Furnaces

Standard features

- ✓ 1200°C, 1500°C or 1600°C maximum operating temperature
- ✓ Based upon standard CTF12/75700, CTF12/100/900, STF 15/610 or STF 16/610 standard furnaces
- ✓ Provides laboratory scale simulation of industrial rotary calcining kilns
- ✓ Powders are heated & agitated within the tube ensuring that all of the sample becomes exposed to the atmosphere
- ✓ A 0 to 5° tilting mechanism controls throughput

Options

specify these at time of order

- ✦ Plain tubes are available in ceramic, quartz or heat resistant metal alloys as well as shaped vessels in quartz & metal equipped with agitation blades.
- ✦ Variable speed drives from 1 to 10 rpm
- ✦ Vibratory feed mechanisms
- ✦ Atmosphere control systems



Large and fully bespoke designs are available up to pilot plant scale (see below)



APPLICATION SPECIFIC FURNACES

One of the natural outcomes arising from customers approaching Carbolite to modify standard furnaces or to manufacture completely bespoke products to meet specific application needs, is the growth of a range of furnaces that are designed for distinctive applications. Applications that can range from calcining powders at a laboratory scale through to assaying precious metals for marking under the International Hallmarking Convention.

More frequently furnaces are designed to enable testing to a specific ISO, BS/EN or ASTM standard method.

As with all the other furnaces in the Carbolite range, the standard design is frequently available with a wide range of alternative voltage configurations and controller options. The furnace described on the page can also provide the basis for customised designs which extend the concept of the initial product into other applications.



PTC 12/20 Portable Thermocouple Calibration Furnace

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ High stability heat source with temperature range 400 to 1200°C
- ✓ Accepts thermocouples up to 7.5mm diameter
- ✓ Thermocouple is inserted & compared to the PTC 12/20's displayed temperature
- ✓ Supplied with traceable Carbolite calibration certificate stating the error between workspace temperature & displayed value at 700°C, 900°C & 1100°C
- ✓ PID temperature control & separate temperature display to 1.0°C resolution
- ✓ Portable & self contained
- ✓ The special work tube design provides a much higher temperature uniformity than is typical for a furnace of this size
- ✓ The metallic worktube is earthed for operator safety when testing metal sheathed mineral insulated mineral thermocouples
- ✓ Weighing in at only 8kg, the rapid heat up and stabilisation of the PTC 12/20 make it ideal to set up and use in the lab or on site

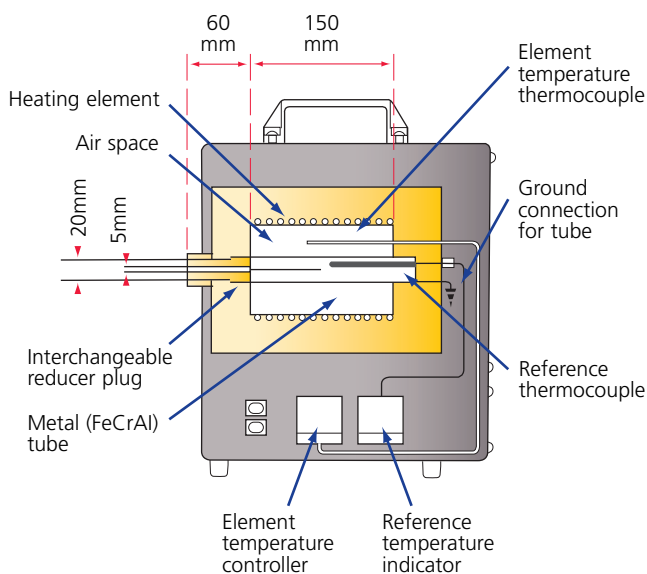


PTC 12/20

Options

specify these at time of order

- ✦ A NAMAS traceable calibration certificate for customer defined setpoints is available.
- ✦ A NAMAS traceable thermocouple is available.



Model	Max temp (°C)	Heat-up time (mins)	Continuous temp (°C)	Temp range (°C)	Stability (°C)	Dimensions			Max power (W)	Thermo-couple type	W't (kg)	Power supply
						Heated tube length (mm)	Cavity diameter (mm)	External H x W x D (mm)				
PTC 12/20	1200	20 (to 1150°C)	1150	400 to 1200	± 0.5 (@ 1150°C)	150	20	399 x 310 x 225	1100	N	8.8	Single phase 120-240V



Continuous operating temperature is 50°C below maximum temperature.

AGD Acid Gas Determinator Furnaces

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Designed for combustion testing of electrical cable to BS EN 50267-1:1999
- ✓ Cable samples are heated within the worktubes at a controlled rate of rise, whilst a small flow of air is passed over the samples & analysed (using separate apparatus) for acidity
- ✓ Four IAP tube design gives increased working capacity
- ✓ Fast resistance wire heating at <40 mins to 800°C (better than 20°C/min to 1000°C)
- ✓ Digital temperature controller providing precise setting & repeatability
- ✓ Highly stable temperature control – the temperature at the centre of each tube will be within $\pm 5^\circ\text{C}$ over a length of 300mm**
- ✓ Low thermal mass insulation
- ✓ Power control by solid state relay, incorporating zero voltage switching

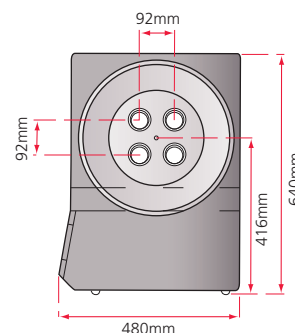
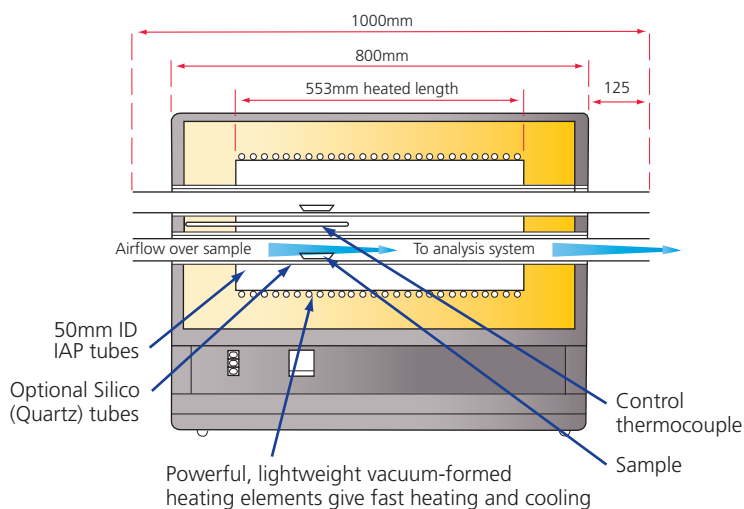


AGD 12/4

Options

specify these at time of order

- ✦ Fused silica inner tubes 41mm inner diameter x 45mm outer diameter x 1000mm (NOTE fused silica tends to devitrify when used above 1000°C)
- ✦ Programmable control to provide automatic cooling after the timed hold at maximum that is required by the standard



Model	Max temp (°C)	Temp range (°C)	Heat-up time (mins) to 1000°C	Dimensions			Max power (W)	Thermo-couple type	Weight (kg)	Power supply
				No. worktubes	Worktube dimensions L x inner Ø x outer Ø (mm)	External H x W x D (mm)				
AGD 12/4	1200	400 to 1200	<40	4	800 x 50 x 60	640 x 800 x 480	1100	N	8.8	Single Phase 220-240V 50/60Hz 20A



* Heat up time is measured 100°C maximum temperature with empty tubes.

** With no gas flow – BSEN 50267-1 1999 requires $\pm 17.5^\circ\text{C}$ with a 'small' gas flow.

IAP is Impervious Aluminous Porcelain.

Continuous operating temperature is 100°C below maximum temperature.

CF Series Cupellation Furnaces for the Assay of Precious Metals

Standard features

- ✓ 1200°C maximum operating temperature
- ✓ Models with a maximum charge capacity of 15, 24, 50 or 60 number 8 cupels
- ✓ Alternatively 24, 32, 72, or 90 number 6 cupels
- ✓ Designed for testing using the cupellation method to ISO11426:199 the standard test method used by the United Kingdom Assay Office, a reference quantitative assay method laid down by the International Hallmark Convention
- ✓ The CF series are internationally renowned for their close temperature uniformity and hazardous fume control *
- ✓ Airflow controlled by an adjustable valve, is preheated before entering the work chamber
- ✓ Silicon carbide elements mounted above & below the chamber provide even heating of cupels, have good resistance to thermal shock & offer extended working life at high temperatures
- ✓ Fumes are extracted through insulated exhaust duct, with removable chamber below chimney to collect condensed lead
- ✓ Up & away counterbalanced vertically opening door complete with observation hole
- ✓ Silicon carbide lined roof & hearth resist the corrosive fumes emitted during the cupellation process
- ✓ Includes 7 day, 24 hour timeswitch

* Fumes are extracted through an insertable exhaust duct and removable container below the chimney.



CF SERIES

Options

specify these at time of order

- ✦ Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- ✦ Modified configurations are available to fit existing fume extraction systems

Note: The furnace should be positioned beneath an efficient fume extraction system preferably fitted with a proprietary lead filter

Model	Max temp (°C)	Dimensions		Volume (litres)	Max power (W)	Thermo-couple type	Weight (kg)	Power supply required per phase
		Internal H x W x D (mm)	External H x W x D (mm)					
CF 15	1200	125 x 220 x 350	1059 x 950 x 950 (bench mounted) 225 x 600 x 380 (Separate control module)	15	9000	Pt/Pt 13% Rh Type R		<i>a1=68A, h3=23A, a3=40A</i>
CF 24	1200	205 x 255 x 460	2110x1050x1070 (floor standing)	24	13000	Pt/Pt 13% Rh Type R	306	<i>a1=87A, h3=28A, a3=50A j3=30A</i>
CF 50	1200	230 x 350 x 540	2100x1150x1100 (floor standing)	50	20000	Pt/Pt 13% Rh Type R		<i>h3=45A, e3=78A, k3=45A</i>
CF 60	1200	250 x 400 x 650	2100x1200x1200 (floor standing)	60	31000	Pt/Pt 13% Rh Type R		<i>h3=62A a3=107A. k3=62A</i>
<i>a1=Single 200-240V, a3=200-240V 3 phase delta, e3=230-240V 3 phase delta, h3=380-415V 3 phase + N, j3=440-480V 3 phase no N, k3=440-480V 3 phase + N</i>								

Temperature Control Options

(★ Specify at the time of order)

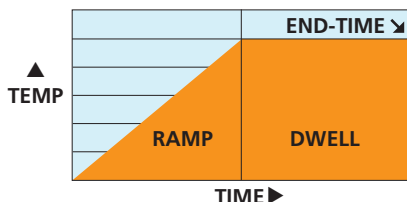
301 Standard Controller



The controller, that is offered as standard with virtually all Carbolite furnaces. The only exceptions being those tube and chamber furnaces operating above 1700°C, where more specialised power control technology is required and those products whose special applications require more complex control e.g. ABA 7/35, multizone tube furnaces etc.

It enables setting of a single ramp rate to set point and incorporates a process timer. Setting is via a smooth wipe clean membrane panel with large bright display.

The 301 provides precise PID (Proportional Integral Derivative) control meaning that ramp rates and set points are very closely adhered to and the risk of overshoot at the end of the ramp is largely avoided.



Options

Over-temperature Control ★

This has a variable setpoint to protect either the chamber or the load. Selection of this option provides an additional independent thermocouple and protection circuit that is fully integrated with the regular 301 controller. Whilst all Carbolite furnaces are designed to fail safe in the event of a controller malfunction, over-temperature protection is strongly recommended for unattended operation or where valuable loads are to be processed.



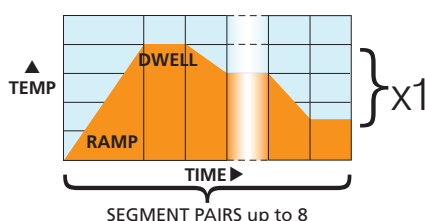
RS232 Communications ★

This permits a single controller to communicate with a computer and requires but does not include suitable PC based software (for example iTools) and connection cables.



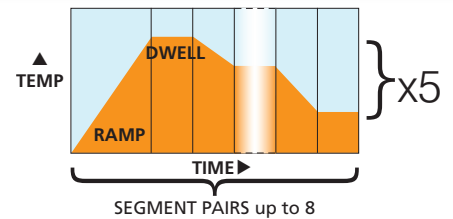
3216P1 ★

This controller offers programmable control using up to 8 segments, each segment comprising a ramp followed by dwell. The dwell may be set to zero time.



3216P5 ★

This controller has all the functionality of the 3216P, with additional capability of being able to store and retrieve up to 5 separate programs.



Options

RS232 & RS484 Communications ★

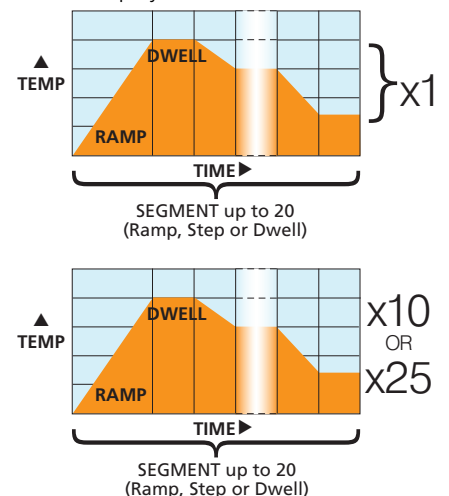
The 3216P1 and 3216P5 controllers both have the option to add RS232 or RS485 communications. This requires but does not include suitable PC based software (for example iTools) and connection cables.

RS232 permits a single controller to communicate with a computer. RS485 permits multiple controllers to communicate with a single computer.



3508P1 ★

This controller offers programmable control in which 20 segments may be set as ramp, step or dwell. (where 'step' is an immediate rise or fall in setpoint temperature). The 3508 series provide a more comprehensive display of information.



3508P10 & 3508P25 ★

The 3508P10 and 3508P25 have all of the functionality of the 3508P1 with the additional capability to store and retrieve 10 and 25 programs respectively. Additionally individual programs can be linked together into longer or more complex sequences.

Options

Over-temperature Control ★

This has a variable setpoint to protect either the chamber or the load. Where the main controller is from the 3216 or 3508 series this is provided by an addition of an independent 2132 controller. Whilst all Carbolite furnaces are designed to fail safe in the event of a controller malfunction over-temperature protection is strongly recommended for unattended operation or where valuable loads are to be processed.



Temperature Control Options

(★ Specify at the time of order)

Cascade Control ★

This should be considered for even more precision and ability to counteract many of the performance effects that result from placing different loads into the chamber. In particular faster heating of loads which have high thermal capacity is possible. A standard controller operates by sensing the temperature close to the elements. In cascade control the primary controller's operation is modified by a second nonprogrammable 3216 controller, which is used to sense the temperature of the load. It is essential that the primary controller is one of the 3508 series

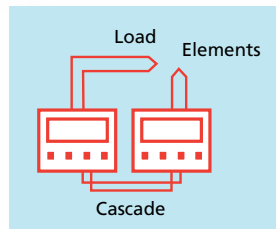


Chart Recorders & DAQs (Data Acquisition Devices) ★

This is just a small selection of the options that are available for recording data from Carbolite furnaces. If you require advice please contact Carbolite for further information.

NOTE: Please confirm with Carbolite whether the chart recorder can be fitted within the standard furnace case, in some instances it may require mounting in a separate case.

4102 Series 100mm Wide Compact Strip Chart Recorder ★

The 4102 series are compact and economical 100mm strip chart recorders, providing recording for up to 4 (continuous pen) or 6 (multi-point) process variables.



4103 Series 100mm Wide Strip Chart Recorder ★

The 4103 is a high specification, 100mm strip chart recorder, providing continuous recording for up to 6 process variables. Information such as channel descriptor, alarm set point and scale information can be viewed on a high resolution VFD display.

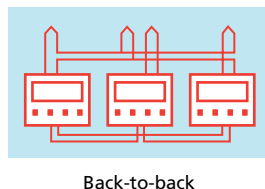


Three Zone Control ★

This usually has the function in triple zone tube furnaces of extending the length of the uniform heated zone.

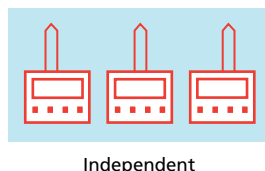
Back-to-back Control

This configuration is supplied as stand for all Carbolite three zone tube furnaces. Normally a master 301 controller operates with two 2132 end-zone controllers.



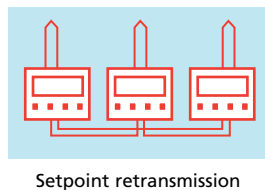
Independent ★

This configuration is available as a no-charge option for three zone tube furnaces and comprises three independent controllers with either 301 or 2132 end zone controllers each with independent thermocouples in their respective zones.



Setpoint Retransmission ★

This optional configuration should be selected for three zone tube furnaces where programmed cooling using a 3216 or 3508 controller is required, in order that the slave end zones adhere to the cooling profile.



Three Zone Cascade Control ★

As in single zone furnaces, cascade control allows faster heating of the furnace load and more precise control of the load temperature. A 3508 controller is required, the end zones are controlled using (non-programmable) 3216CC controllers.

Model	Channels (pens)	User programmable	Accuracy To paper (%)	Speed mm/hr ★	Annotation ★
4102C	1	✗	0.25	10, 30, 60, 120 or 5, 20, 60, 120	Extra option
4102C	2	✗		20, 30, 60, 120 or 30, 60, 120, 300 or	Extra option
4102M	6	✗			Standard
4103C	1	✓		Software selectable	Standard
4103C	2	✓			Standard
4103M	6	✓			Standard

Temperature Control Options

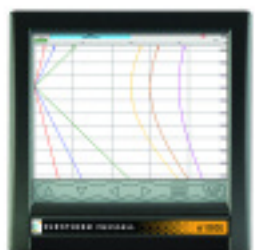
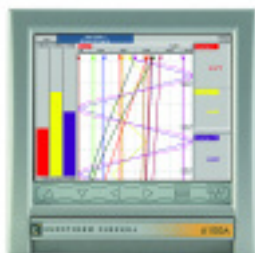
(★ Specify at the time of order)

6100 Series Digital Data Acquisition

Recorder & Display ★

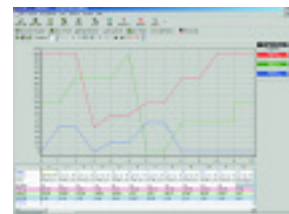
A series of digital data acquisition recorders, that able to function as stand alone devices or be integrated into wider network systems. They have a total sample rate of 125ms for up to 48 input channels. Input channels are freely configurable to suit your process requirements. Each instrument has an intuitive. A touch screen display to enables operators to clearly view process data in varying formats.

All have onboard Flash data storage capability, Ethernet communication and choice of Compact Flash or SD Card. Data is stored in a tamper resistant binary format that can be used for secure, long term records of your process. Recording can be to internal flash memory, removable media and remote FTP (simultaneously if required) Data protection includes Audit Trail for 21CFR Part 11 and NADCAP applications, with recorded login, use of unique usernames and passwords. Event triggers such as batch start, alarm and percentage full level for media can be programmed.



iTools Software

A versatile suite of software that allows Carbolite furnaces that have been fitted with appropriate digital communications hardware to be set-up recorded and monitored from a PC. The supplied license is for a single PC to communicate with one furnace using RS232 or with many furnaces using RS485.



NOTE: The 301 controller is not compatible with RS485 communications.

Model	Channels	Display Screen	Memory For History Mb	Inputs	USB Ports	Serial Ports	Timers	Event Triggers
6100E	6	5.5" VGA	6	6	1	✗	6	3
6100A	6	12.1" XGA	32 or 96	up to 18	up to 3	up to 2	12	up to 96
6100A	12	12.1" XGA	32 or 96	up to 18	up to 3	up to 2	12	up to 96

Calibration Certificates

A number of calibration options can be supplied each of which is available with either with either a factory certificate of calibration or a certificate from a UKAS accredited laboratory and hence traceable to a UK National Standard.



Factory issued certificate for the thermocouple only calibrated at 3 temperature points ★

UKAS traceable certificate for the thermocouple only calibrated at 3 temperature points ★

Factory issued certificate for the temperature controller (or temperature display) 3 point calibration ★
At 3 points of our choosing.

UKAS traceable certificate for the temperature controller (or temperature display) 3 point calibration ★
At 3 points of our choosing.

Factory issued certificate for the specific individual combination of thermocouple & temperature controller (or temperature display) 3 point calibration ★

UKAS traceable certificate for the specific individual combination of thermocouple & temperature controller (or temperature display) 3 point calibration ★

For Advice and Specifications to Comply with NADCAP (AMS 2750D) for Heat Treatment Applications

Please contact Carbolite for advice on this or any other standards compliance issues.

Tube Furnace Options & Accessories for Heating

ID Inner Diameter
OD Outer Diameter

Up to 900, 1000, 1200°C
15 ~ 38mm **ID**
130 ~ 400mm heated length

Up to 1200°C
65 ~ 105mm **ID**
550 ~ 900mm heated length

MTF 9, 10 or 12 Series

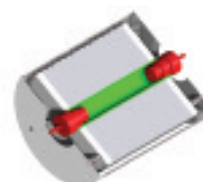
CTF or TZF 12 Series

Suitable for
heating in air

Furnace including
Standard worktube
+ **Insulation end plugs type C**
(ref 51-50-1 or 51-50-2)



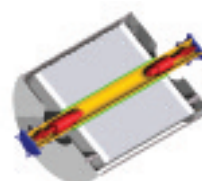
Furnace
+ **Standard worktube**
+ **Insulation end plugs type C**
(ref 51-50-1 or 51-50-2)



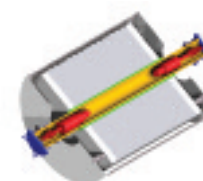
Suitable for an
inert gas
atmosphere
(or vacuum to
 10^{-3} bar using
NW flange seals)



Furnace including
Standard worktube
+ **Extended worktube type D**
(one size below heated ID & length
+ 300mm)
+ **Insulation end plugs type D**
(ref 51-50-1)
+ **Gas tight end seals**
(ref 41-37-1)

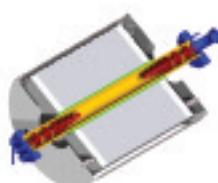


Furnace
Standard worktube
+ **Extended worktube type D**
(one size below heated ID & length +
300mm or 250mm for CTF 12/100/900)
+ **Insulation end plugs type D**
(ref 41-50-11 or 41-50-12)
+ **Gas tight end seals**
(ref 41-37-1 or 41-37-2)

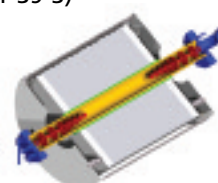


Suitable for
vacuum to
 10^{-5} bar)

Furnace including
Standard worktube
+ **Extended worktube type D**
(one size below heated ID & length
+ 300mm)
+ **Radiation end shields type D**
(ref 41-51-1)
+ **Vacuum end seals**
(ref 41-37-5 + 51-39-1)



Furnace
Standard worktube
+ **Extended worktube type D**
(one size below heated ID & length
+ 600mm)
+ **Radiation end shields**
(ref 41-51-1 or 41-51-2)
+ **Vacuum end seals**
(ref 41-37-5 or 41-37-6 + 51-39-2
+ 51-39-3)



Please note that additional components are required for vertical configurations
Thermocouple entry glands are available for both gas tight and vacuum end seals
Tube supports 49-64-1 recommended for extended length tubes

in AIR, MODIFIED ATMOSPHERE & VACUUM

Up to 1200°C
65 ~ 170mm **OD**
300 ~ 1200mm heated length

Up to 1600°C
60 ~ 90mm **OD**
180 ~ 610mm heated length

Up to 1800°C
90 ~ 140mm **OD**
200 ~ 600mm heated length

G or split 12 Series

STF or TZF 16 or 16 Series

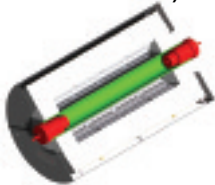
CTF, TZF 17, 18 or PVT Series

Furnace

Standard worktube

(up to the max OD & heated length + 200mm)

+ **Insulation end plugs type C**
(ref 51-50-1 or 51-50-2)



Furnace

+ Standard worktube

(up to the max OD & heated length)

+ **Insulation end plugs type C**
(ref 51-50-3 or 51-50-4)

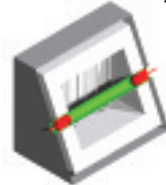


Furnace

+ Standard worktube

(up to the max OD & heated length + 600mm)

+ **Insulation end plugs type C**
(ref 51-50-5 or 51-50-6)



Furnace

+ Extended worktube type D

(up to the max OD & heated length + 600mm)

+ **Insulation end plugs type D**
(ref 41-50-11 or 41-50-12)

+ **Gas tight end seals**
(ref 41-37-1 or 41-37-2)



Furnace

+ Extended worktube type D

(up to the max OD & heated length + 300mm)

+ **Insulation end plugs type D**
(ref 41-50-13 or 41-50-14)

+ **Gas tight end seals**
(ref 41-37-3 or 41-37-4)



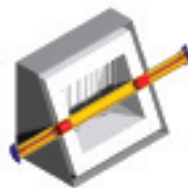
Furnace

+ Extended worktube type D

(up to the max OD & heated length + 900mm)

+ **Insulation end plugs type C**
(ref 41-50-15)

+ **Gas tight end seals**
(ref 41-37-3 or 41-37-4)



Furnace

+ Extended worktube type D

(up to the max OD & heated length + 600mm)

+ **Radiation end shields**
(ref 41-50-5 or 41-50-6)

+ **Vacuum end seals**
(ref 41-37-1 or 41-37-2)
+ 51-39-2 + 51-39-3



Furnace

+ Extended worktube type D

(up to the max OD & heated length + 300mm)

+ **Radiation end shields**
(ref 41-51-3 or 41-51-4 or 45-51-5)

+ **Vacuum end seals with water cooling**
(ref 41-37-7 or 41-37-8 + 51-39-2 + 51-39-3)



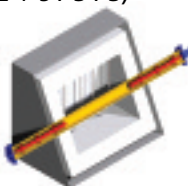
Furnace

+ Extended worktube type D

(up to the max OD & heated length + 900mm)

+ **Insulation end shields**
(ref 41-50-15)

+ **Vacuum end seals with water cooling**
(ref 41-37-7 or 41-37-8)
+ 51-39-2 + 51-34-3



Work tubes - temperature & chemical compatibility

Tube Material	Physical & chemical properties			Maximum temperatures in air °C	
	Porous(P) / Impervious (I)	‡Resistance to thermal shock	Chemical resistance	Horizontal	Vertical
Silimanite (AL ₂ O ₃ SiO ₂)	P	Good	Good chemical resistance but porous	1500	1600
IAP (Impervious aluminous porcelain)	I	Very good	Good chemical resistance against gases with the exception of fluorine	1400	1500
Mullite (3Al ₂ O ₃ .2SiO ₂ .A)	I	Very good	Resistant to flux sulphurous or carbonaceous atmospheres	1500	1550
RCA (Recrystallised alumina)	I	Good	Highly resistant to chemical attack, except fluorine	1800	1900
Quartz (Limited availability)	I	Very good	Generally good but reactive with sodium & at upper temperature limit with metals, carbonates & halides	1100	1100
APM** (Advanced powder metallurgy - FeCrAl alloy)	I	Excellent	Resistant to Oxidation, carburization & sulphidation	1300*	1350

* Short or supported tubes only as APM will bend at this temperature

**Unsuitable for use in wirewound outer work tubes due to high electrical conductivity

‡ Resistance to thermal shock is partly dependent upon specific tube geometry

Recommendations are for guidance only and the suitability of a material for a specific application can only be confirmed when we know the complete details of the service conditions.

Carbolite wire wound tube furnaces may be used without an accessory worktube. If however a modified atmosphere or vacuum is required for the application then an accessory worktube is required. The accessory worktube needs to be longer for those applications when gas tight or vacuum tight endseals are required. The degree of extension depends upon the specific furnace, the temperature and the accessories to be fitted. Contact Carbolite or your local distributor for more information.

Some tube furnaces do not have the element directly wound onto the outer surface of the worktube and in these cases an accessory worktube is always required.

The intended application determines which will be the best material to use for on the basis of the tube's operating temperature range, porosity, chemical resistance and tolerance to thermal shock. Towards the upper limits of a worktube's temperature range the intended orientation is also important.

Extended tube lengths as well as the added weight of accessories fitted to worktube ends may cause them to flex under heating. Tube end supports are recommended in order to avoid this.

Even where samples are only heated in air addition of end plugs greatly increases uniformity. This is particularly important for larger diameter tubes over 25mm and for vertical furnace configurations, where convection currents can have a significant effect on uniformity if end plugs are not used.

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1100°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32												
28	34												
38	46												
38	51												
50	60												
53	61												
60	70												
64	73												
75	83												
75	86												
77	87												
78	91												
80	95												
100	120												
110	125												
117	128												
125	140												
134	146												
152	164												
150	170												

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1300°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32												
28	34												
38	46												
38	51												
50	60												
53	61												
60	70												
64	73												
75	83												
75	86												
77	87												
78	91												
80	95												
100	120												
110	125												
117	128												
125	140												
134	146												
152	164												
150	170												

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1350°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32												
28	34												
38	46												
38	51												
50	60												
53	61												
60	70												
64	73												
75	83												
75	86												
77	87												
78	91												
80	95												
100	120												
110	125												
117	128												
125	140												
134	146												
152	164												
150	170												

Work tubes - temperature compatibility

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1400°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32	■	■	■	■		■		■		■		
28	34												
38	46		■		■								
38	51												
50	60	■	■		■				■		■		
53	61												
60	70		■		■				■				
64	73												
75	83			■	■		■		■	■	■		
75	86	■	■	■	■		■		■	■	■		
77	87												
78	91												
80	95								■				
100	120		■			■							
110	125		■	■	■		■		■	■	■		
117	128												
125	140								■	■	■		
134	146												
152	164												
150	170		■	■	■	■			■	■	■	■	■

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1500°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32	■ (v)	■ (v)	■ (v)	■ (v)		■ (v)		■ (v)		■ (v)		
28	34												
38	46		■		■								
38	51												
50	60	■	■		■				■ (v)		■ (v)		
53	61												
60	70		■		■				■ (v)				
64	73												
75	83			■	■		■		■	■	■		
75	86	■ (v)	■ (v)	■ (v)	■ (v)		■ (v)		■ (v)	■ (v)	■ (v)		
77	87												
78	91												
80	95							■ (v)					
100	120		■			■							
110	125		■ (v)	■ (v)	■ (v)		■ (v)		■ (v)	■ (v)	■ (v)		
117	128												
125	140								■ (v)	■ (v)	■ (v)		
134	146												
152	164												
150	170		■	■	■	■			■	■	■	■	■

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1550°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32	■ (v)	■ (v)	■ (v)	■ (v)		■ (v)		■ (v)				
28	34												
38	46												
38	51												
50	60	■ (v)	■ (v)		■ (v)				■ (v)		■ (v)		
53	61												
60	70												
64	73												
75	83			■ (v)	■ (v)		■ (v)		■ (v)	■ (v)	■ (v)		
75	86												
77	87												
78	91												
80	95								■				
100	120		■			■							
110	125								■	■	■		
117	128												
125	140								■	■	■		
134	146												
152	164												
150	170		■	■	■	■			■	■	■	■	■

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1600°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32	■	■	■	■		■		■				
28	34												
38	46		■		■								
38	51												
50	60	■	■		■				■		■		
53	61												
60	70		■		■				■				
64	73												
75	83												
75	86		■	■	■		■		■	■	■		
77	87												
78	91												
80	95								■				
100	120		■ (v)			■ (v)							
110	125								■	■	■		
117	128												
125	140								■	■	■		
134	146												
152	164												
150	170		■ (v)	■ (v)	■ (v)	■ (v)			■ (v)	■ (v)	■ (v)	■ (v)	■ (v)

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1800°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32	■	■	■	■		■		■				
28	34												
38	46		■										
38	51												
50	60	■	■		■				■		■		
53	61												
60	70		■		■				■				
64	73												
75	83												
75	86		■	■	■		■		■	■	■		
77	87												
78	91												
80	95								■				
100	120												
110	125								■	■	■		
117	128												
125	140								■	■	■		
134	146												
152	164												
150	170								■	■			

Tube inner diam (mm) ▼	Length (mm) ▶ ▼ Tube outer diam (mm)	Standard Tube Sizes for Up to 1900°C											
		450	600	750	900	1000	1050	1100	1200	1350	1500	1650	1800
19.5	26												
25	32	■ (v)	■ (v)	■ (v)	■ (v)		■ (v)		■ (v)				
28	34												
38	46		■ (v)										
38	51												
50	60	■ (v)	■ (v)		■ (v)				■ (v)		■ (v)		
53	61												
60	70		■ (v)		■ (v)				■ (v)				
64	73												
75	83												
75	86		■ (v)	■ (v)	■ (v)		■ (v)		■ (v)	■ (v)	■ (v)		
77	87												
78	91												
80	95								■ (v)				
100	120												
110	125								■ (v)	■ (v)	■ (v)		
117	128												
125	140								■ (v)	■ (v)	■ (v)		
134	146												
152	164												
150	170								■ (v)	■ (v)			

Silimanite
IAP
Mullite
RCA



Quartz
APM (require support
at this temp)



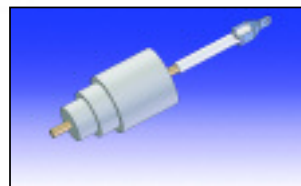
Requires support (s)
Vertical configuration only (v)

Work Tube Accessories

(♦ Please specify full tube dimensions, furnace model and operating temperature at time of order)

Ceramic insulating plugs ♦

Ceramic fibre board plugs with a 6mm central tube are designed to reduce heat loss from tube ends and are particularly helpful for vertical tubes and tube diameters over 25mm. Two types (C & D) are supplied for use with standard and extended length work tubes respectively. Additional support mountings must be ordered for their installation into vertical worktubes.



C type end plug



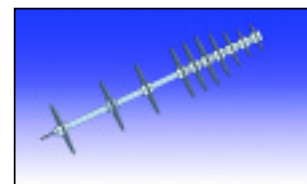
D type end plug

Radiation shields ♦

Constructed from either ceramic or dust free metal discs on a central tube, these are used where the porous nature of ceramic plugs makes them unsuitable. Most often in vacuum applications or where a high purity atmosphere is required. Additional support mountings must be ordered for installation into vertical worktubes.



Ceramic radiation shields



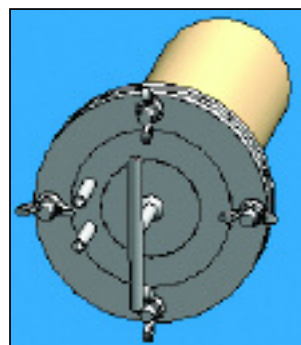
Metal radiation shields

Gas tight end seals ♦

These comprise stainless steel discs which are equipped with a 6mm gas nozzle as standard or optionally with an NW16, NW25 or NW40 flange. Thermocouple glands to accept 1.5mm, 3mm and 10mm probes can also be added. Gas tight end seals can only be used on extended worktubes and are designed to be used in combination with insulation plugs or radiation shields (see above).

Water cooled gas tight end seals are recommended where furnaces are to be operated at 1500°C or more. These assemblies can be used for medium vacuum applications down to 10⁻³ bar

In order to accommodate the added weight of end tube end supports are recommended seal assemblies.

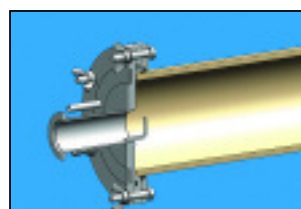


Gas tight end seal with water cooling

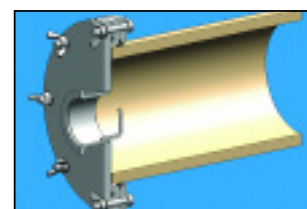
High vacuum end seals ♦

These comprise stainless steel discs which are equipped with an industry standard vacuum flange. They can only be used on extended worktubes and are designed to be used in combination with radiation shields.

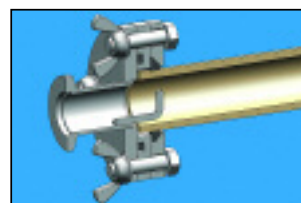
Water cooled high vacuum end seals are recommended where furnaces are to be operated at 1500°C or more. These assemblies can be used for medium vacuum applications down to 10⁻⁵ bar



76-86 tube seal with NW25



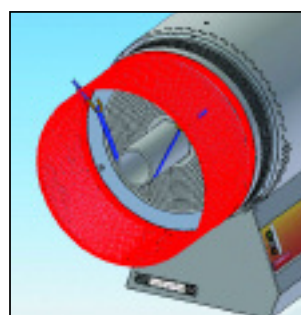
100-120 tube seal with NW40



19-25 tube seal with NW16

Tube supports ♦

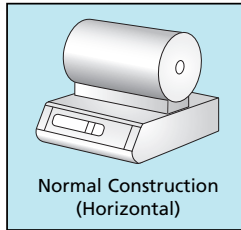
Designed to support extended worktubes and the additional weight of end seal assemblies, they reduce worktube stresses and can improve a tube's life expectancy.



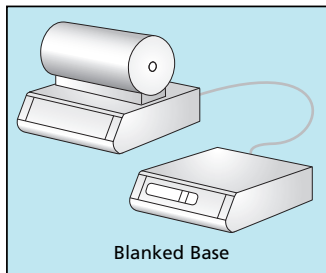
Optional accessory tube supports for STF series

Mounting Configurations

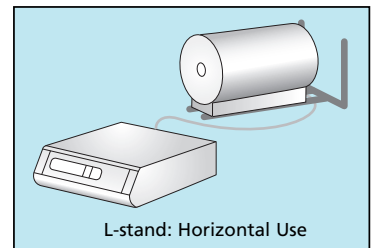
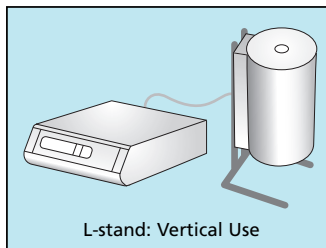
The normal configuration for horizontal tube furnaces in the MTF, CTF, STF and the three zone TZF furnaces is for the furnace body to be mounted directly onto a control module base unit.



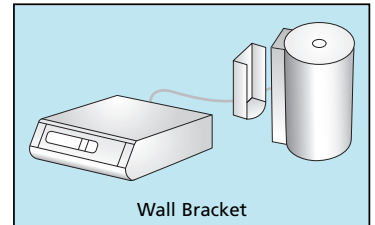
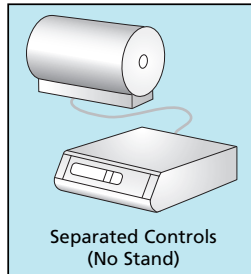
However several other options are available at time of order. The furnace body can be mounted on a so called 'blankedbase' linked to either a 2 or 6 metre power conduit to a second control module containing all of the control electronics.



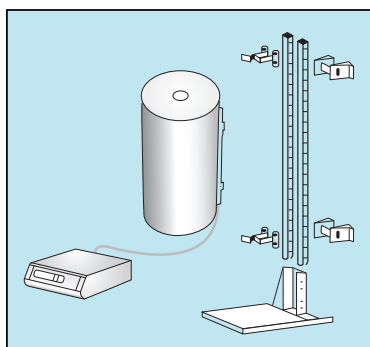
Alternatively the furnace body can be supplied mounted to a separate 'L' style stand which allows it to be freely positioned separately from the control module in either a horizontal or vertical position. (Note that different work tube mounting accessories may be required to change from horizontal to vertical operation, or vice versa).



The furnace body may optionally be supplied separately from the base and either completely without a stand or with a wall mounting bracket.

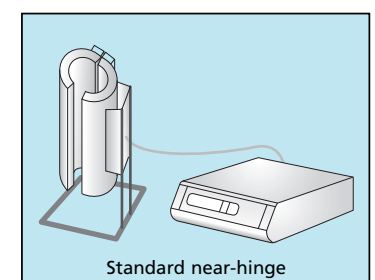
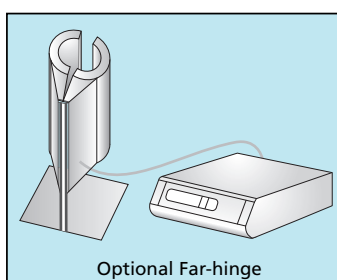


G range tube furnaces are similarly available with a complete 'G' pattern stand or optionally with just support rail portion of the stand (without the foot) with or without a wall mounting bracket.



Split tube furnaces from the HST and HZS ranges are optionally available for dual vertical and horizontal use mounted upon an 'L' style stand. They are also available completely without stands and in a so called 'farhinge' configuration which enables the split furnace to open wide than the conventional hinge.

VST and TVS range vertical split tube furnaces are similarly available without stands and in 'farhinge' designs as an alternative to the standard 'nearhinge' configuration. The far hinge configuration opens wider to give easier access when using large or awkwardly positioned worktube or test pieces.



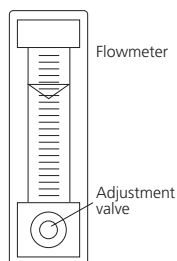
Modified Atmosphere

(★ Specify at the time of order)

There are a number of methods of working in Carbolite furnaces using a modified, usually inert atmosphere or with vacuum. A range of worktube accessories are listed on page 56 to enable this.

Gas Flow-meters ★

The walls of chamber furnaces are frequently permeable so gas flow-meters with a standard length of 100mm and 3% accuracy can be added.



Inert Gas Inlet ★

A 6mm hose connection that is usually placed on the furnace side and connected to the chamber via a ceramic tube. Suitable for the introduction of inert gas or oxygen.

NOTE The introduction of gases may alter heating characteristics and /or performance characteristics of furnace elements, please contact Carbolite for advice.

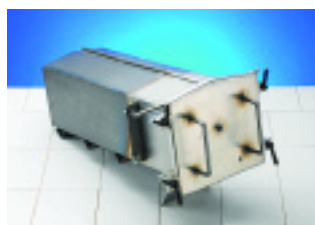
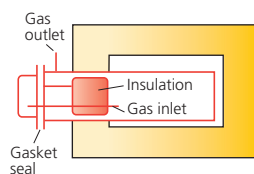
Solenoid Valves ★

Electrically operated valves, activated by a panel mounted switch or using a 3216 or 3508 controller to start or stop gas flows.

Atmosphere Retorts (1100°C) ★

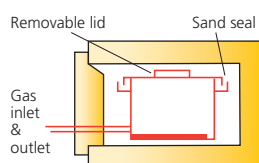
Type A105

A range of Inconel enclosures sealed by front opening insulated door plugs, gas inlet and outlet connections are easily accessible towards the front. These should be specified at time of order so that the door interlock mechanism is modified.



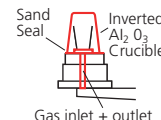
Type A107 ★

A range of deep Inconel retorts similar to a pack carburising box, they have a shallow removable lid on top which is seated into a sand seal. Front mounted gas inlets / outlet connections extend through slots in the modified furnace door.



Inverted Crucible ★

For bottom loaded, raised hearth furnaces gas may be introduced through a modified hearth and retained by an inverted metal bell jar or ceramic crucible.



Atmosphere Control System ★

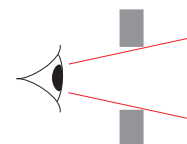
This system is suitable for use with either tube furnaces using gas tight end seal assemblies of chamber furnaces using Type A105 retorts. Housed in its own cabinet the system is recommended where hydrogen gas is required for processing. It provides greater safety and convenience in control of hydrogen and nitrogen purge gas. Provides protection when introducing hydrogen at low temperatures, provides a monitored burn-off pilot flame and senses failure of gas supplies and is equipped with hydrogen and nitrogen flow-meters, using a pressure system. For mass flow systems contact Carbolite.



Entry Ports

Access and Viewing Ports ★

A 25 mm diameter hole is placed through the furnace door in one of two optional formats; with either a pivoted stainless steel cover disc or a permanent quartz window.



Thermocouple Calibration Port ★

An additional thermocouple, similar to the control thermocouple is built into the furnace and connected to the a thermocouple socket externally mounted on the control panel, so as to enable connection of temperature recorders.



Thermocouple Calibration Port ★

An additional ceramic thermocouple sheath is installed adjacent to the control thermocouple. This allows the user to insert a reference thermocouple for checking and calibration of the furnaces controller / thermocouple. Typically this is in the rear of the chamber.

Servicing, Maintenance & Parts

Carbolite works closely with its worldwide network of dealers to ensure that you have easy local access to service, preventative maintenance and replacement parts. To improve even further, a new dedicated Aftermarket Facility has been established at our factory in the UK.

This unit will not only provide a base from which our team of field service engineers can operate but will carry stocks of the most common spare parts.

Preventative Maintenance

- ❖ To satisfy the requirements of quality management systems e.g. ISO 9001:2008, NADCAP, AMS 2750D
- ❖ To help ensure health & safety of operational personnel
- ❖ To monitor the condition of equipment so as to avoid costly, unexpected breakdowns
- ❖ To avoid wasted energy through heat loss
- ❖ To ensure the integrity of results and measurements obtained from your equipment

Custom Designed Plans

- ❖ Our maintenance plans are custom-made to meet your specific requirements, whether it is support for a single unit an entire department or all units within an organisation.
- ❖ Each contract is discussed and agreed with the user to provide a core of functional and safety checks.

Inspection

- ❖ Preventative maintenance
- ❖ Thermal surveying & calibration
- ❖ Condition monitoring
- ❖ Functional checks
- ❖ Provision of detailed reports
- ❖ Thermography

Repair

- ❖ Advantageous response, charge rates and parts pricing for maintenance contract holders
- ❖ Factory trained, fully qualified, IEEE 17th edition certified engineers
- ❖ All repair work warranted

Calibration

- ❖ Of thermocouples
 - ❖ Of temperature indicators
 - ❖ Of temperature measurement systems
 - ❖ Of uniformity
 - ❖ To local, national or UKAS standard
 - ❖ Provision of reports / certificates
 - ❖ Automatic reminders to avoid non-compliances
-

**FOR UK COVER CONTACT
the Carbolite Servicing helpdesk
Tel: 01433 624242
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