

## GPC – General Purpose Chamber Furnaces

The GPC general purpose chamber furnaces are larger floor-standing models. Available at 1200°C and 1300°C with capacities ranging from 131 to 350 litres.

### Standard features

- 1200°C or 1300°C maximum operating temperature
- Programmable 3216P1 controller
- Over-temperature protection
- 131, 200, 300 or 350 litre chamber volumes
- Free radiating coiled wire elements on two sides and roof
- All models have under hearth heating
- Low thermal mass insulation for fast response & energy efficiency
- Up & away door keeps heated surface away from the user
- Hard wearing refractory hearth plate resists damage & supports heavier loads
- Heating elements are easily serviced



GPC 12/131 with optional custom built sample support rack

### Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers is available. These can be fitted with RS232, RS485 or Ethernet communications (see pages 106–111)
- AMS2750E Nadcap compatible models are available for aerospace applications
- Various loading and unloading management options can be supplied

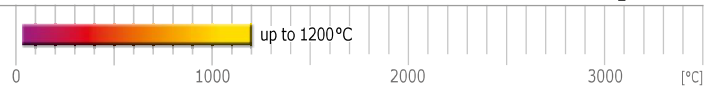
## Technical data

CGH Model	Max. temp. [°C]	Heat-up time [mins]	Max. continuous operating temperature [°C]	Dimensions: Usable chamber H x W x D [mm]	Dimensions: External with door open H x W x D [mm]	Volume [litres]	Max. power [W]	Thermocouple type	Weight [kg]
GPC 12/131B	1200	150	1100	350 x 500 x 750	1860 x 1260 x 1230 (1860)	131	24000	R	400
GPC 12/200B	1200	–	1100	400 x 600 x 900	1930 x 1360 x 1380 (1930)	200	30000	R	518
GPC 12/300B	1200	–	1100	550 x 600 x 900	2080 x 1360 x 1380 (2080)	300	36000	R	600
GPC 12/350B	1200	–	1100	550 x 600 x 1050	2080 x 1360 x 1530 (2080)	350	39000	R	650
GPC 13/131B	1300	–	1200	350 x 500 x 750	1860 x 1260 x 1230 (1860)	131	24000	R	400
GPC 13/200B	1300	–	1200	400 x 600 x 900	1930 x 1360 x 1380 (1930)	200	30000	R	518
GPC 13/300B	1300	–	1200	550 x 600 x 900	2080 x 1360 x 1380 (2080)	300	36000	R	600
GPC 13/350B	1300	–	1200	550 x 600 x 1050	2080 x 1360 x 1530 (2080)	350	39000	R	650

**i** Please note:

- Heat up time is measured to 100°C below max, using an empty chamber
- Holding power is measured at continuous operating temperature

The following models GPC 12/36, GPC 13/36, GPC 12/65 & GPC 13/65 have been renamed CWF; see page 31 of the catalogue.



## GPCMA - Modified Atmosphere Chamber Furnaces

Our GPCMA chamber furnaces are equipped with a metallic retort to provide a uniform heated volume with a controlled atmosphere. These floor-standing models have a smooth action double pivot door. Available with a range of maximum temperatures from 1000°C to 1200°C depending on the selected retort material. Retort working volumes range from 37 to 245 litres. Oxygen levels can be reduced to 30 ppm depending on the application. Perfect for stress relieving additive manufactured components particularly those produced via DMLS. This range of furnaces can be optionally specified for compliance to AMS2750E Nadcap Class 1 for aerospace applications.

**NEW**


GPCMA/174 with semi automatic gas system with digital flowmeters and data logging options

### Applications

- Stress relieving 3D printed additive manufactured parts
- Pyrolysis
- Debinding

### Standard features

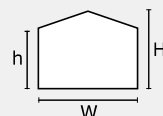
- A range of maximum temperatures dependent on retort material:
  - 310 Stainless Steel retort 1000°C maximum
  - 314 Stainless Steel retort 1050°C maximum
  - Inconel 601 retort 1100°C maximum
  - Haynes 230 retort 1150°C maximum
  - APMT retort 1200°C maximum
- Programmable 3508P1 controller
- 2-zone cascade control
- Over-temperature protection
- 37, 56, 117, 174, 208, or 245 litre retort volume
- Semi-automatic gas system with analogue flowmeters for nitrogen
- Free radiating coiled wire elements on two sides, the roof and under the hearth (37 litre: two sides and under hearth)
- Low thermal mass insulation for fast response & energy efficiency
- Smooth action double pivot door shields the user from excessive heat
- Type R control thermocouples
- Internal retort thermocouple: type K up to 1100°C, type N above 1100°C
- Silicone rubber water cooled door seal
- Door safety interlock

### Options (specify these at time of order)

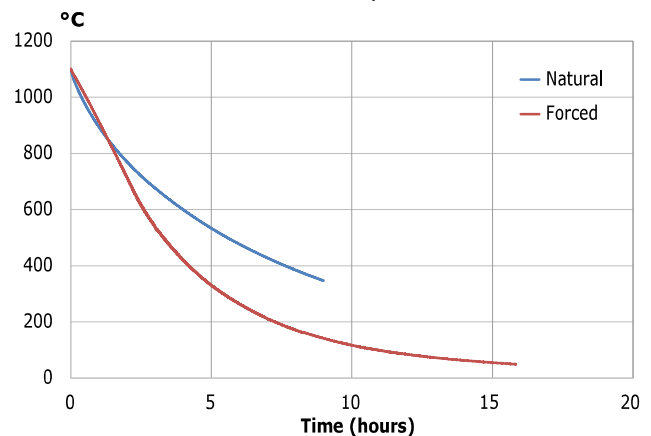
- Vacuum option (10<sup>-2</sup> mbar) for faster atmosphere exchange **at room temperature only**. A vacuum retort **MUST** be ordered with this option
- Semi-automatic gas system with analogue flowmeters for argon
- Semi-automatic gas system with digital flowmeters (will be data logged if a data logger option is selected)
- Automatic gas system with gas monitoring and control with mass flow controllers
- Oxygen monitoring system with 3504 programmer
- Automatic forced cooling system
- Afterburner option (NOT compatible with vacuum option/ vacuum retorts)
- Chiller unit, 5 litre/min, 1 kW.
- A range of sophisticated digital controllers, multi-segment programmers and data loggers is available. These can be fitted with RS232, RS485 or Ethernet communications (see pages 106 - 111)
- AMS2750E Nadcap compatible models are available
- Various loading and unloading options can be supplied

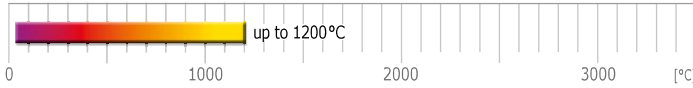
### GPCMA retort internal dimensions

Model	Height h/H [mm]	Width W [mm]	Depth [mm]
GPCMA/37	205/230	337	538
GPCMA/56	238/295	400	665
GPCMA/117	278/345	500	815
GPCMA/174	428/495	500	815
GPCMA/208	428/495	500	965
GPCMA/245	500/574	600	815



### Cool down rates for GPCMA/174





## GPCH2 - Hydrogen atmosphere

The Carbolite Gero GPCH2 furnaces are designed specifically for use with a hydrogen atmosphere. The GPCH2 furnace range has the same retort capacities as the GPCMA furnace range and incorporates all the safety equipment required for safe use with hydrogen.

Please refer to the Carbolite Gero GPCH2 product range which is detailed in the 'Vacuum, Inert and Reactive Gas Furnaces catalogue'.



GPCH2

### Furnace capacity for typical AM base plate sizes

Model	Retort capacity Plate size 350 x 250 x 250 (H x W x D) [mm]	Retort capacity Plate size 400 x 400 x 400 (H x W x D) [mm]
<b>GPCMA/37</b>	1 plate, max height 100 mm	Not applicable
<b>GPCMA/56</b>	1 plate, max height 150 mm	Not applicable
<b>GPCMA/117</b>	2 plates, max height 200 mm	1 plate, max height 200 mm
<b>GPCMA/174</b>	2 plates, max height 350 mm	1 plate, max height 350 mm
<b>GPCMA/208</b>	3 plates, max height 350 mm	2 plate, max height 350 mm
<b>GPCMA/245</b>	4 plates, max height 400 mm	1 plate, max height 400 mm



### Temperature Uniformity

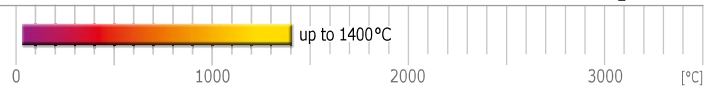
- Can achieve AMS2750E Class 1, instrument type B:  $\pm 3^\circ\text{C}$

### Temperature and atmosphere requirements for AM metals heat treatment

Carbolite Gero product range	Material	Temperature	Atmosphere
<b>HTMA (see page 22)</b>	Aluminium	500°C	Air or inert gas
<b>GPCMA</b>	Titanium	900°C - 1100°C	Argon
<b>GPCMA</b>	Tool Steel	900°C - 1100°C	Argon
<b>GPCMA</b>	Co/Cr	1150°C	Argon
<b>GPCMA</b>	Inconel 718	960°C & 1060°C Requires fast cooling to 200°C. (2-4 hrs)	Argon
<b>GPCMA</b>	Ti-6Al-4V	750°C - 950°C	Argon
<b>GPCMA</b>	Inconel 625	900°C	Argon
<b>GPCMA</b>	Copper alloys	900°C	Argon

## Technical data

Model	Retort Volume [litres]	Max. temp with Retort	Dimensions (H x W x D) [mm]			Power [W]	Weight [kg]
			External Overall Size	Retort Internal Size	Uniform volume $\pm 5^\circ\text{C}$		
<b>GPCMA/37</b>	37	dependent on retort material	1990 x 900 x 1326	205 x 337 x 538	100 x 250 x 300	17000	220
<b>GPCMA/56</b>	56	dependent on retort material	1846 x 1260 x 1725	229 x 400 x 610	150 x 275 x 300	24000	485
<b>GPCMA/117</b>	117	dependent on retort material	1896 x 1360 x 1875	279 x 500 x 840	200 x 400 x 550	30000	608
<b>GPCMA/174</b>	174	dependent on retort material	2045 x 1360 x 1875	428 x 500 x 815	350 x 400 x 550	36000	705
<b>GPCMA/208</b>	208	dependent on retort material	2045 x 1360 x 2025	428 x 500 x 970	350 x 400 x 800	39000	800
<b>GPCMA/245</b>	245	dependent on retort material	2145 x 1460 x 2025	500 x 600 x 815	400 x 500 x 500	45000	950



## LCF – Large Chamber Furnaces

**The robust construction of the LCF large chamber furnaces makes them ideal for applications such as the heat treatment of steels and alloy, ceramics sintering and aerospace heat treatment.**

The LCF range is often customised in order to precisely meet the user's requirements. This range also provides a foundation upon which a wide range of custom modifications can be added. Typical examples include the more sophisticated control systems and data recording that is required for applications such as AMS2750E heat treatment under Nadcap. Solutions are available to handle heavier loads or assist in loading and unloading the furnace, or larger chamber sizes than are offered in the standard range.

### Standard features

- 1200°C & 1400°C maximum temperatures
- Programmable 3216P1 controller
- Over-temperature protection
- Excellent temperature uniformity and control
- Robust construction using hollow steel section & zinc coated steel sheet
- Double skin construction ensures safe outer case temperature
- Manually operated vertically opening door keeps the hot face away from the operator
- Low thermal mass insulation for high energy efficiency
- Hard wearing silicon carbide tiled hearth
- 1200°C range heated by heavy gauge wire elements in roof and below the hearth
- 1400°C range heated by silicon carbide elements in roof and below the hearth
- Safety door interlock isolates power from the elements whenever the door is opened



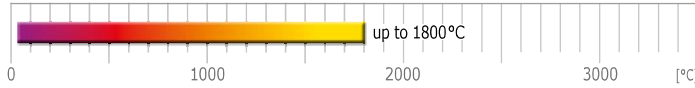
Customised  
3-zone LCF 12/560

### Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers is available. These can be fitted with RS232, RS485 or Ethernet communications (see pages 106 – 111)
- Pneumatically or electrically operated doors
- A range of retorts can be supplied for using modified atmospheres up to 1000°C
- Remote control module
- Designs for compliance with AMS2750E (Nadcap) and other industry standards

## Technical data

CGH	Max. temp. [°C]	Max. continuous operating temperature [°C]	Dimensions: Usable chamber H x W x D [mm]	Dimensions: External H x W x D [mm]	Volume [litres]	Max. power [W]	Thermocouple type
LCF 12/202	1200	1150	300 x 600 x 1120	2360 x 1280 x 1640	202	24000	R
LCF 12/405	1200	1150	450 x 750 x 1200	2560 x 1440 x 1750	405	35000	R
LCF 12/560	1200	1150	500 x 750 x 1500	2700 x 1500 x 2300	560	45000	R
LCF 12/675	1200	1150	500 x 750 x 1800	2700 x 1500 x 2600	675	60000	R
LCF 12/720	1200	1150	600 x 1000 x 1200	2950 x 1575 x 1810	720	60000	R
LCF 14/125	1400	1400	250 x 500 x 1000	2310 x 1340 x 1650	125	30000	R
LCF 14/350	1400	1400	400 x 760 x 1130	2545 x 1549 x 1800	350	48000	R
LCF 14/480	1400	1400	500 x 800 x 1200	2560 x 1650 x 1900	480	60000	R
LCF 14/725	1400	1400	500 x 720 x 1790	2620 x 1480 x 2470	725	60000	R



## HB – Top Hat Furnaces

**The HB furnace range has an automatically operated vertically moving hood for heat treatment in air.**

The moving hood design allows samples to be accessed from three sides. The HB can be equipped with CrFeAl heating wires up to 1300°C or with MoSi<sub>2</sub> heating elements for temperatures up to 1800°C

The HB hood furnaces are available with usable volumes of 80 to 514 litres with the inner space being rectangular in design and the base plate having a convenient height of 750 mm. The hood moves up and down automatically to load and unload the sample.

All debinding applications require the use of an optional afterburner. The afterburner is driven by propane gas and compressed air to burn any evaporating binder. Carbolite Gero specializes in custom designed furnaces and can also create a customised version of the HB to accommodate specific heat treatment needs. It is possible to equip a gas circulating system to improve temperature uniformity. Several sample thermocouples can be inserted into the furnace chamber to monitor and test the temperature profile. Through the use of a serial interface, the thermocouple data is logged at predefined intervals for evaluation. The furnace is operated manually with a Eurotherm controller. Other controllers are available upon request.



HB 13/240

### Standard features

- 1300°C, 1600°C, 1700°C & 1800°C maximum operating temperatures
- Carbolite Gero 3216CC controller with single ramp to set point and process timer
- From 80 to 514 litre capacities
- FeCrAl wire heating elements for temperatures below 1300°C
- High quality molybdenum disilicide heating elements for temperatures above 1600°C
- Advanced refractory interior, used in combination with energy efficient low thermal mass insulation

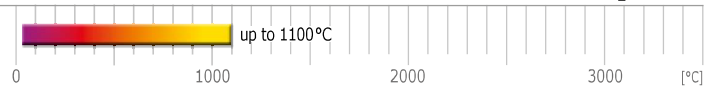
### Options (specify these at time of order)

- A range of sophisticated digital controllers, multi-segment programmers and data loggers is available. These can be fitted with RS232, RS485 or Ethernet communications (see pages 106 – 111). Please note that special controllers may be needed for this model
- Over-temperature protection (recommended to protect valuable contents & for unattended operation)
- Other sizes on request
- Gas inlet for operation under modified atmosphere (not gas tight)
- Afterburner for debinding applications

## Technical data

CGN Model	Max. temp. [°C]	Uniformity between 800°C and T <sub>max</sub> [°C] (DIN 17052)	Max. heat-up rate [°C/min]	Cooling time [h]	Dimensions: Usable chamber H x W x D [mm]	Dimensions: External H x W x D [mm]	Volume [l]	Max. power [kW]
HB_/80	1300, 1600, 1700, 1800	±5	5, 10, 10, 10	12, 14, 14, 14	500 x 400 x 400	2200 x 1200 x 1200	80	18, 45, 50, 60
HB_/160	1300, 1600, 1700, 1800	±5	5, 10, 10, 10	14, 14, 14, 14	500 x 800 x 400	2200 x 1800 x 1200	160	30, 80, 85, 90
HB_/240	1300, 1600, 1700, 1800	-	-	14	500 x 1200 x 400	2200 x 2200 x 1200	240	63, 65, 69, 75
HB_/430	1300, 1600, 1700, 1800	-	-	-	600 x 1200 x 600	2500 x 2200 x 1500	430	-
HB_/514	1300, 1600, 1700, 1800	-	-	-	780 x 1200 x 550	2700 x 2200 x 1400	514	-

**i** Please note:  
- Maximum continuous operating temperature is 100°C below maximum temperature



## SBCF – Static or Bogie Hearth Chamber Furnaces

**The robust construction of the SBCF large chamber furnace makes it ideal for applications such as the heat treatment of steels and alloys, ceramics sintering and aerospace heat treatment.**

The SBCF chamber furnace is an industrial scale furnace based on a modular design principle which can be adapted to various applications. The furnace chamber is cubic in shape and is available in three sizes.

The furnace has a side hinged door and a fixed hearth. As an option the hearth can be fitted to a bogie so it can be pulled out of the furnace on a track system. This hearth design technique also allows the furnace to be easily adapted to a vertical lift arrangement to provide an elevator hearth, in which case the door would become a fixed side of the chamber.

Under hearth heating and free radiating coiled wire elements on four sides. This design provides the option of single and 3-zone temperature control and for applications demanding the best uniformity possible, such as AMS 2750E (this can be combined with an optional air circulation fan).

The construction uses low thermal mass insulation materials to maximise running efficiency whilst using robust refractory materials where physical strength is required such as the loading area of the hearth. Silicon carbide (SiC) tiles are fitted on the hearth to provide a hard wearing surface.



SBCF 11/1700

### Options (specify these at time of order)

- Temperature interlocked door
- Bogie hearth
- Vertical air circulation fan
- Available with various instrumentation and data acquisition options

### Standard features

- 1100°C maximum operating temperature
- Single zone models fitted with programmable 3508P1
- 3-zone models fitted with 1 x programmable 3508P1 and 2 x 3216CC slaves
- Retransmission of setpoint on 3-zone models
- Over-temperature protection

- Furnace can meet the requirements of AMS2750E
- Under hearth heating and free radiating coiled wire elements on four sides
- Excellent temperature uniformity and control
- Robust construction ensures safe outer case temperature
- Double skin construction ensures safe outer case temperature
- Hard wearing silicon carbide tiled hearth

## Technical data

CGH Model	Zones	Max. temp. [°C]	Dimensions: External H (with fan / without fan) x W x D [mm]	Volume [litres]	Chamber size H x W x D [mm]	Uniform volume H x W x D [mm]	Temperature uniformity [°C]	Max. power [W]
<b>Single Zone Static or Bogie Hearth Chamber Furnace</b>								
SBCF-1/11/500	1	1100	2353/2130 x 1710 x 1354	512	800 x 800 x 800	600 x 600 x 600	±10	54000
SBCF-1/11/1700	1	1100	2753/2530 x 2110 x 1754	1728	1200 x 1200 x 1200	1000 x 1000 x 1000	±10	96000
SBCF-1/11/3300	1	1100	3053/2830 x 2410 x 2054	3375	1500 x 1500 x 1500	1300 x 1300 x 1300	±10	144000
<b>3-Zone Static or Bogie Hearth Chamber Furnace</b>								
SBCF-3/11/500	3	1100	2353/2130 x 1710 x 1354	512	800 x 800 x 800	600 x 600 x 600	±5	54000
SBCF-3/11/1700	3	1100	2753/2530 x 2110 x 1754	1728	1200 x 1200 x 1200	1000 x 1000 x 1000	±5	96000
SBCF-3/11/3300	3	1100	3053/2830 x 2410 x 2054	3375	1500 x 1500 x 1500	1300 x 1300 x 1300	±5	144000

**i Please note:**

- Maximum continuous operating temperature is 100 °C below maximum temperature