# Installation, Operation & Maintenance Instructions

## 1200°C - 1300°C Chamber Furnaces
## GPC models

This manual is for the guidance of operators of the above Carbolite products and should be read before the furnace is connected to the electricity supply.

CONTENTS



**Manuals are supplied separately for the furnace controller (and overtemperature controller when fitted).**

Please read the controller manuals before operating the furnace.

## 1.0 INTRODUCTION

### 1.1 GPC models

This manual covers both the “laboratory” and “industrial” GPC furnaces.

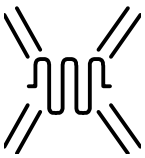
The laboratory models are GPC 12/36, GPC 13/36, GPC 12/65 and GPC 13/65. These are designed for bench mounting, but can be supplied with a stand.

The industrial models are GPC 12/131, 13/131 and GPC 12/200. These are floor standing units.

The furnaces are fundamentally similar in operation, but the industrial sizes are altogether larger and therefore require somewhat different handling and siting.

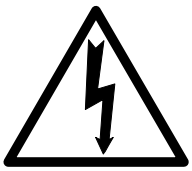
### 1.2 Switches and Lights

Supply Light: when the furnace is connected to the electrical supply the light in the adjacent switch glows



Heat Light: the adjacent light glows or flashes to indicate that power is being supplied to the elements

### 1.3 Warning Symbols



DANGER of electrical shock– read any warning printed by this symbol.

DANGER – hot surface. Read any warning printed by this symbol.

WARNING: all surfaces of a furnace may be hot.

DANGER – read any warning printed by this symbol.

## 2.0 INSTALLATION

### 2.1 Unpacking & Handling

*Laboratory Models.* When unpacking or moving the furnace always lift it by its base. Never lift it by the door. Use two people to carry the furnace. Remove any packing material from the door gear and furnace chamber before use.

*Industrial Models.* Use a fork lift or pallet truck to position the furnace on a level floor.

### 2.2 Siting

Place the furnace in a well ventilated area, away from other sources of heat, and on a surface which is resistant to accidental spillage of hot materials. Do not mount the furnace on an inflammable surface.

Ensure that there is free space around the furnace. Do not obstruct any of the vents in the control section: they are needed to keep the controls cool.

Ensure that the furnace is placed in such a way that it can be quickly switched off or disconnected from the electrical supply - see below.

### 2.3 Setting Up

The furnace is supplied with the hearth tiles supported in place by a timber batten or steel plate held by a jacking bolt fixed through the roof chimney hole. The chimney is supplied separately. For the industrial models the door counterbalance weights are also supplied separately.

*Laboratory models.* Remove the bands holding the frame to the top of the furnace case. Withdraw the bracket with the jacking rod assembly. Remove the steel plate from the hearth tile.

Fit the supplied furnace chimney through the roof hole.

*Industrial models.* To remove, take off the roof panel and unscrew the bracket complete with the jacking rod assembly.

Fit the furnace chimney before replacing the roof panel.

Fit the door counterbalance weights to the door shaft such that the locking screws lock into the countersunk holes. Note that one of the weights has a flat surface on the boss opposite the locking screw. This weight goes on the side by the limit switch assembly such that the plunger of the switch is depressed when the door is opened.

### 2.4 Fume Removal

If the furnace is to be used to heat substances which emit fumes, then a fume extraction duct of about 150mm inlet diameter may be placed directly above the chimney outlet. Do not make a sealed connection to the furnace chimney as this causes excessive airflow through the chamber and gives poor temperature uniformity.

## 2.5 Electrical Connections

*Connection by a qualified electrician is recommended.*

All GPC models have three internal circuits and are normally supplied for three phase supply. This may be either star or delta, but a furnace must only be connected to the type and voltage of supply for which it was made (but see 2.6). If the furnace is ordered for a single phase supply, this may be Live to Neutral reversible or non-reversible, or Live to Live.

Access to electrical connections is by removal of the back panel (laboratory models), or removal of the lower back panel (industrial models). The industrial models are fitted with an internal isolator; cabling should be taken through the mesh base panel directly to the isolator or the nearby terminals: live connections to the isolator; neutral (if present) and earth to the nearby terminals.

Check the furnace rating label before connection. The supply voltage should agree with the voltage on the label, and the supply capacity should be sufficient for the amperage on the label.

The supply should be fused at the next size equal to or higher than the amperage on the label. A table of the most common fuse ratings is also given in section 8.1 of this manual. Where a supply cable is present there are internal supply fuses; customer fusing is preferred but not essential.

Furnace with supply cable: either wire directly to an external isolator or fit with a line plug.

Furnace without supply cable: a permanent connection to a fused and isolated supply should be made to after temporary removal of the furnace back panel.

Connection by line plug: the plug should be within reach of the operator, and should be quickly removable.

Connection to external isolating switch: this should operate on both conductors (single phase) or on all live conductors (three phase), and should be within reach of the operator.

The supply MUST incorporate an earth (ground).

CONNECTION DETAILS

| | | | ***supply type*** | |
|---|---|---|---|---|
| **Supply** | **Terminal label** | **Cable colour** | *Live-Neutral* | *Reversible or Live-Live* |
| ***1-phase*** | L | Brown | To live | to either power conductor |
| | N | Blue | To neutral | to the other power conductor |
| | PE | Green/Yellow | To earth (ground) | to earth (ground) |

| **supply** | **Terminal label** | **Cable colour** | |
|---|---|---|---|
| ***3-phase*** | L1 | Black | to phase 1 |
| | L2 | Black | to phase 2 |
| | L3 | Black | to phase 3 |
| | N | Light Blue | to neutral *except delta* |
| | PE | Green/Yellow | to earth (ground) |

## 2.6 "Universal Wiring"

From Year 2000 GPC 12/36 and GPC 13/36 models can be easily rewired between 1-phase and 3-phase supplies. This applies to 3-phase+N and 3-phase delta in the ranges 380/220V–415/240V and 208-240V, but does not apply to 3-phase star without neutral (e.g 380V).

To alter the configuration, remove the back panel and alter the wiring connections between the supply terminal block and the EMC filters, using the appropriate diagram from section 7.6.

## 2.7 Voltage and Power Limit

⚠ When first starting up the furnace check the setting of the OP.Hi parameter (see controller manual) and compare it with the data in section 8.2. If the power limit setting is incorrect for the voltage of your supply, change it. This must be done immediately if the setting of OP.Hi is higher than it should be.

## 3.0 OPERATION

*The instructions for operating the temperature controller are given in a separate manual.*

*If the furnace is fitted with a time switch, see also the supplementary manual MS03.*

*If cascade control is fitted, see the supplementary manual MS07.*

### 3.1 Operating Cycle

The furnace is fitted with a combined Supply light and Instrument switch. The light is on whenever the furnace is connected to the supply. The switch cuts off power to the control circuit.

Connect the furnace to the electrical supply. The Supply light should glow.

Operate the instrument switch to activate the temperature controller; the **O** position is *off*, the **I** position *on*. The controller becomes illuminated and goes through a short test cycle.

Close the furnace door and adjust the temperature controller – see the controller manual.

*Overtemperature option only.* If the overtemperature controller has not yet been set as required, set it and activate it according to the instructions in the appropriate manual.

Unless a time switch is fitted and is off, the furnace starts to heat up. The Heat lights glow steadily at first and then flash as the furnace approaches the desired temperature or a program setpoint.

*Overtemperature option only.* If the overtemperature trip operates then an indicator in the overtemperature controller flashes, and the heating elements are isolated. Find and correct the cause before resetting the overtemperature controller according the instructions supplied.

To switch the furnace off, set the Instrument switch to **O**. If the furnace is to be left off, isolate it from the electrical supply.

### 3.2 General Operating Notes

Heating element life is shortened by use at temperatures close to maximum. Do not leave the furnace at high temperature when not required. The maximum temperature is shown on the furnace rating label and on the back page of this manual.

When heating large objects, in particular poor conductors, avoid shielding the thermocouple from the heating elements. The thermocouple is intended to sense the temperature near the heating element, but if a large object is placed in the chamber it may record the average temperature of the object and the elements, which can lead to overheating of the elements. Allow large objects to gain heat at a lower temperature and then reset the controller to a temperature close to the desired maximum.

When heating materials which produce smoke or fumes, the chimney must be correctly fitted and unobstructed. Otherwise, soot can accumulate in the chamber and could possibly cause an electrical breakdown of the heating element.

If the furnace is used to heat materials which emit smoke or fumes, regularly heat it up to maximum temperature for one hour without load to burn away the soot.

### 3.3 Use of Probes

Any metal object used to probe into the furnace chamber while the furnace is connected to the supply must be earthed (grounded). This applies in particular to metal sheathed thermocouples, where the sheaths must be earthed. The refractory material of the chamber lining becomes partly conducting at high temperatures, and the electric potential inside the chamber can be at any value between zero and the supply voltage. Unearthed probes can cause serious electric shock.

### 3.4 Atmospheres

When an optional gas inlet is fitted there is a label near the inlet saying "INERT GAS ONLY". In practice *inert* or *oxidising* gases may be used, but *not combustible or toxic gases*. Chamber furnaces are not gas tight, so it should be understood that gas usage may be high, and that the chamber is likely always to contain some air. Residual oxygen levels 1% are to be expected.

If a metal retort is supplied with this furnace, please see the supplementary manual MS05.

### 3.5 Operator Safety

The furnace incorporates a safety switch which interrupts the heating element circuit when the door is opened. This prevents the user touching a live heating element, but also prevents the furnace from heating up if the door is left open. The operation of this switch should be checked periodically – see section 4.1.2.

Avoid burns: furnace surfaces can be hot. Before you remove a hot object from the furnace make sure you have a safe place to put it down.

### 3.6 Power Adjustment

The furnace control system incorporates electronic power limiting. The power limit parameter OP.Hi may be accessible to the operator, but should not generally be altered.

A table of the correct power limit values is given in section 8.2. Note that in GPC models the standard value is in many cases not 100%.

The power limit may be set to a lower limit if the furnace is to be used at a low temperature only: this may give better control stability. It may set to zero to permit demonstration of the controls without the heating elements taking power; to resume heating reset it to its standard value.

## 4.0 MAINTENANCE

### 4.1 General Maintenance

Preventive rather than reactive maintenance is to be preferred. The type and frequency depends on furnace use: the following are recommended.

#### 4.1.1 Cleaning

Soot deposits may form inside the furnace, depending on the process. At appropriate intervals remove these by heating as indicated in section 3.2.

The furnace outer surface may be cleaned with a damp cloth. Do not allow water to enter the interior of the case or chamber. Do not clean with organic solvents.

#### 4.1.2 Safety Switch

The door switch operation mentioned in 3.5 should be checked periodically to ensure that heating elements are isolated when the door is opened. In normal conditions the safety arrangement should outlast the furnace, but it could be affected by rough handling, a corrosive environment or work materials, or exceptional frequency of use.

A qualified electrician should check that the supply to the heating elements is cut, with and without power being on, when the door is open partially and fully; it is important that isolation is not just marginally achieved. The check is best made on the element terminals after removal of the furnace back: probing the element surface inside the furnace could be inconclusive because of surface oxidation. Note that all live supply wires of a 3-phase supply, and both live and neutral of a 1-phase supply, should be isolated when the door is opened.

### 4.2 Calibration

After prolonged use the controller and/or thermocouple could require recalibration. This would be important for processes which require accurate temperature readings or which use the furnace close to its maximum temperature. A quick check using an independent thermocouple and temperature indicator should be made from time to time to determine whether full calibration is required. Carbolite can supply these items.

Depending on the controller, the controller manual may contain calibration instructions.

### 4.3 After Sales Service

Carbolite's service division (Thermal Engineering Services) has a team of Service Engineers capable of repair, calibration and preventive maintenance of furnace and oven products at our customers' premises throughout the world. We also sell spares by mail order. A telephone call or fax often enables a fault to be diagnosed and the necessary spare part despatched.

Each furnace has its own record card at Carbolite. In all correspondence please quote the serial number, model type and voltage given on the rating label of the furnace. The serial number and model type are also given on the front of this booklet when supplied with a furnace.

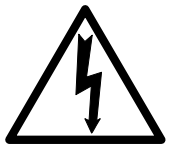
To contact Thermal Engineering Services or Carbolite see the back page of this manual.

### 4.4 Recommended Spares Kits

Carbolite can supply individual spares, or a kit of the items most likely to be required. Ordering a kit in advance can save time in the event of a breakdown. Each kit comprises one thermocouple, one sheath, one solid state relay, one door insulation piece (laboratory models), and set of elements.

When ordering spares please quote the model details as requested above.

## 5.0 REPAIRS & REPLACEMENTS



### 5.1 Safety Warning – Disconnection from Supply

Always ensure that the furnace is disconnected from the supply before repair work is carried out.

### 5.2 Safety Warning - Refractory Fibrous Insulation

This furnace contains refractory fibres in its thermal insulation. These materials may be in the form of fibre blanket or felt, vacuum formed board or shapes, mineral wool slab or loose fill fibre.

Normal use of the furnace does not result in any significant level of airborne dust from these materials, but much higher levels may be encountered during maintenance or repair.

Whilst there is no evidence of any long term health hazards, we strongly recommend that safety precautions are taken whenever the materials are handled.

**Exposure to dust from fibre which has been used at high temperatures may cause respiratory disease.**

**When handling fibre always use an approved mask, eye protection, gloves and long sleeved clothing.**

**Avoid breaking up waste material. Dispose of waste fibre in sealed containers.**

**After handling rinse exposed skin with water before washing gently with soap (not detergent). Wash work clothing separately.**

Before commencing any major repairs we recommend reference to the European Ceramic Fibre Industry Association Bulletin No. 11 and the UK Health and Safety Executive Guidance Note EH46.

We can provide further information on request. Alternatively our service division can quote for any repairs to be carried out at your premises or ours.

### 5.3 Temperature Controller Replacement

200 & 201. These controllers are fitted to the back of the control panel, which can be separated from the base by removal of two screws.

⚠ Before handling the controller: **wear an anti-static wrist strap** or otherwise avoid any possibility of damage to the unit by static electricity.

Refer to the instructions supplied with the replacement controller.

2132, 2416, 2408 etc. Ease apart the two lugs at the side; grip the instrument and withdraw it from its sleeve; push in the replacement.

### 5.4 Solid-state Relay Replacement

Disconnect the furnace from the supply and remove the furnace back panel.

Make a note how the wires are connected to the solid state relay, and disconnect them.

Remove the solid state relay from the base panel or aluminium plate.

Replace and reconnect the solid state relay ensuring that the heat-conducting thermal pad is sandwiched between the relay and the base panel or aluminium plate. Alternatively a thin layer of white, heat-conducting silicon paste may be applied between the new relay and the plate.

The new solid state relay contains a built-in MOV which protects it from short periods of excess voltage. If the old relay had a separate disc-shaped "MOV" connected between the high voltage terminals of the old relay, discard the old MOV.

Replace the removed panel.

## 5.5 Thermocouple Replacement

Disconnect the furnace from the supply, and remove the furnace back panel.

Make a note of the thermocouple connections. The negative leg of the thermocouple is marked blue. Compensating cable colour codings are:

| *negative* | *positive (type R)* |
|---|---|
| white | orange |

Disconnect the thermocouple from its terminal block.

Remove the screw to release the thermocouple sheath, withdraw the sheath, and shake out any fragments of thermocouple.

Re-assemble with a new thermocouple observing the colour coding, ensuring that the thermocouple is not twisted as it is being inserted and that the screw refitted to grip the sheath.

## 5.6 Element Replacement (Laboratory Models)

⚠ *See section 5.2- wearing a face mask is recommended.*

The chambers have two side-mounted refractory panels in which coiled heating elements are inserted; each side contains 3 “hairpin” elements giving 6 coils of heating wire per side.

Disconnect the furnace from the electrical supply and remove the back panel.

Make a written plan showing ALL the element and thermocouple connections. It is important to make this plan for each individual furnace.

Loosen the clamping screws onto the terminal blocks holding the faulty element. If necessary straighten the bent ends of the wire.

From within the chamber, carefully lift the elements out of the channels in the element carrier. Each element is retained at the front by the unwound portion being trapped between the front brickwork and the element carrier.

If necessary, use a sharp knife to relieve the element carrier at the front with a 45° cut on the “bridge” portion to aid withdrawal of the element.

Take care to minimise damage to the delicate fibre element carrier.

Finally pull the tails out through the back insulation.

Fit the new element. It may be help to feed a flexible plastic or nylon tube, with a bore just larger than the element wire, through the terminal block into the chamber. Fit the element wire into this tube; as the tube is withdrawn, the element can be through the terminal block.

When both parts of the element are located in the channels gently pull the ends of the element until the first spiral is level with the back chamber wall insulation. If the element spirals are pulled too far into the cavity between the back insulation and the element carrier, overheating may occur.

If necessary, bend the element tails, supporting the wire so as not to damage the insulation. Cut off any excess wire and firmly tighten the terminal block screws.

Refit the back panel.

Check that the furnace is controlling properly to rule out the possibility that previous element failed because of a fault elsewhere in the control circuit.

## 5.7 Element Replacement (Industrial Models)

⚠ *See section 5.2 - wearing a face mask is recommended; also gloves. This operation requires two people and a cold furnace. Check that the door counterweights hold the door up safely.*

The chambers contain 12 off IAP tubes on which the 6 “hairpin” elements are mounted. The elements run from back-to-front-to back. The connections are accessed by removal of the upper back panel. The front end of the hairpin is restrained from sliding along the tubes by a hook.

Disconnect the furnace from the electrical supply and remove the back panel.

It is advisable to make a written plan showing all the element and thermocouple connections to avoid any problems when reconnecting to the power and other wires.

Loosen the clamping screws onto the terminal blocks holding the faulty element. Use two spanners to avoid cracking the porcelain material. If necessary straighten the bent ends of the wire. This must be done for both ends of the element, i.e. for two adjacent terminal blocks.

Withdraw the tube on which the wire spiral is mounted, through the back. The second person should assist by supporting the tube within the chamber and easing the element off it.

From within the chamber, lift the wire element off the hook holding the front end, and remove the element through the furnace door.

Fit the new element. At the same time one person should feed the tubes through from the back, and the other should feed the wire spirals onto the tube.

To get the wire ends through correctly it may help to feed a flexible plastic or nylon tube, with a bore just larger than the element wire, through the terminal block into the chamber. Fit the element wire into this tube; as the tube is withdrawn, the element feeds through the terminal block.

Finally locate the element correctly. At the front, connect the hook. At the back, ensure that the last turn of the spiral is approximately one turn away from the insulation. Then tighten the terminal block screws.

If necessary, cut off any excess wire.

Refit the back panel.

Check that the furnace is controlling properly to rule out the possibility that the previous element failed because of a fault elsewhere in the control circuit.

## 5.8 Fuse Replacement

Fuses are marked on the circuit diagram (section 7.0) with type codes, e.g. F1, F2. A list of the correct fuses is given in section 8.1. *Depending on model and voltage, the different fuse types may or may not be fitted.*

If any fuse has failed, it is advisable for an electrician to check the internal circuits.

Replace any failed fuses with the correct type. For safety reasons do not fit larger capacity fuses without first consulting Carbolite.

The fuses are near the cable entry point, and access is by removal of the back panel.

## 5.9 Door Plug Replacement (Laboratory models)

⚠ *See section 5.2 - wearing a face mask is recommended.*

The door insulation is made of bonded refractory sections, supplied as one piece.

Lift the furnace door to the open position and remove the door cover from the plug carrier assembly by loosening the nuts at each side.

From the front, unscrew the self-tapping screws which hold the upper door plug retention bracket in place, and remove the bracket.

Remove the old door plug.

Place the new door plug in position, ensuring that the chamfered edge is uppermost.

Refit the upper bracket and door cover.

When first heating the furnace after a replacement, ensure that the ventilation is good: emission of some fumes may be expected.

## 6.0 FAULT ANALYSIS

### A. Furnace Does Not Heat Up

1. The **HEAT** light is **ON**
   - → The heating element has failed
     - → Check also that the SSR is working correctly

2. The **HEAT** light is **OFF**
   - The controller shows **a very high temperature** or a code such as S.br
     - → The thermocouple has broken or has a wiring fault
   - The controller shows a **low temperature**
     - → The door switch(es) (if fitted) may be faulty or need adjustment
     - → The contactor (if fitted) may be faulty
     - → The SSR could be failing to switch on due to internal failure, faulty logic wiring from the controller, or faulty controller
   - There are no lights glowing on the controller
     - → The **SUPPLY** light is **ON**
       - → The controller may be faulty or not receiving a supply due to a faulty switch or a wiring fault
     - → The **SUPPLY** light is **OFF**
       - → Check the supply fuses and any fuses in the furnace control compartment

### B. Furnace Overheats

1. The **HEAT** light goes **OFF** with the instrument switch
   - → The controller shows a **very high** temperature
     - → The controller is faulty
   - → The controller shows a **low** temperature
     - → The thermocouple may have been shorted out or may have been moved out of the heating chamber
     - → The thermocouple may be mounted the wrong way round
     - → The controller may be faulty

2. The **HEAT** light **does not go off** with the instrument switch
   - → The SSR has failed "ON"
     - → Check for an accidental wiring fault which could have overloaded the SSR

## 7.0 CIRCUIT DIAGRAMS

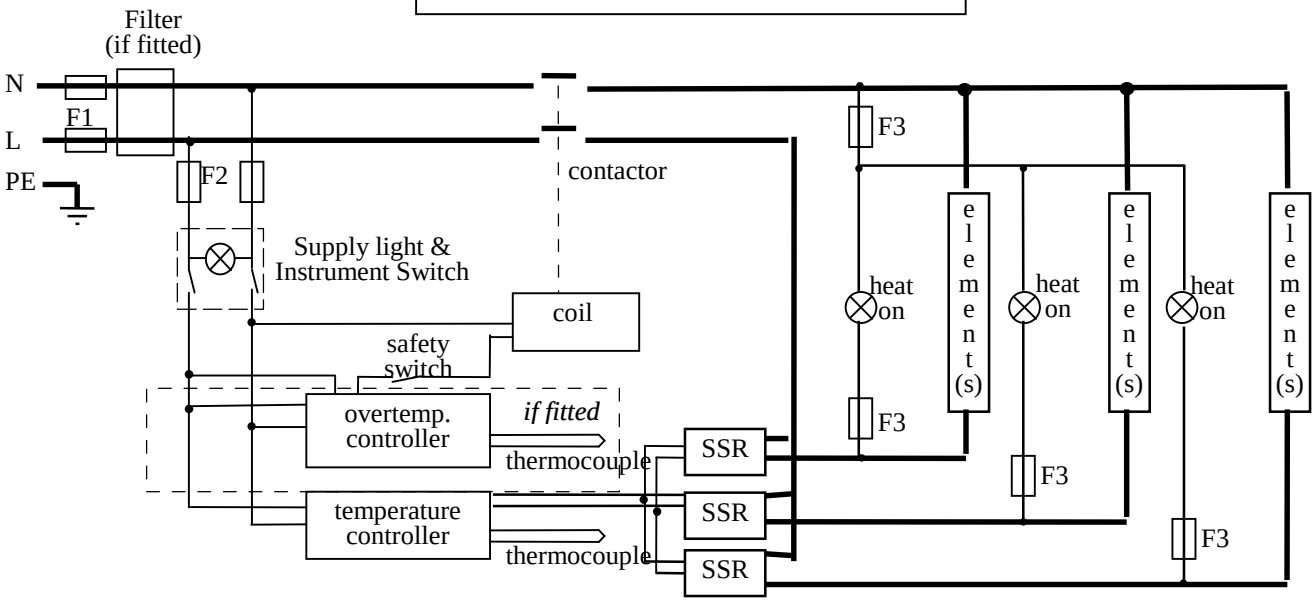
In all GPC models the safety switch in the diagram is a positive-break door switch.

EMC Filters (if fitted): dependent on the model there may be one filter, or more than one fitted in parallel. The circuit diagram examples do not show multiple filter arrangements.

ISOLATOR: the industrial models have an internal isolator which is not shown in these diagrams.

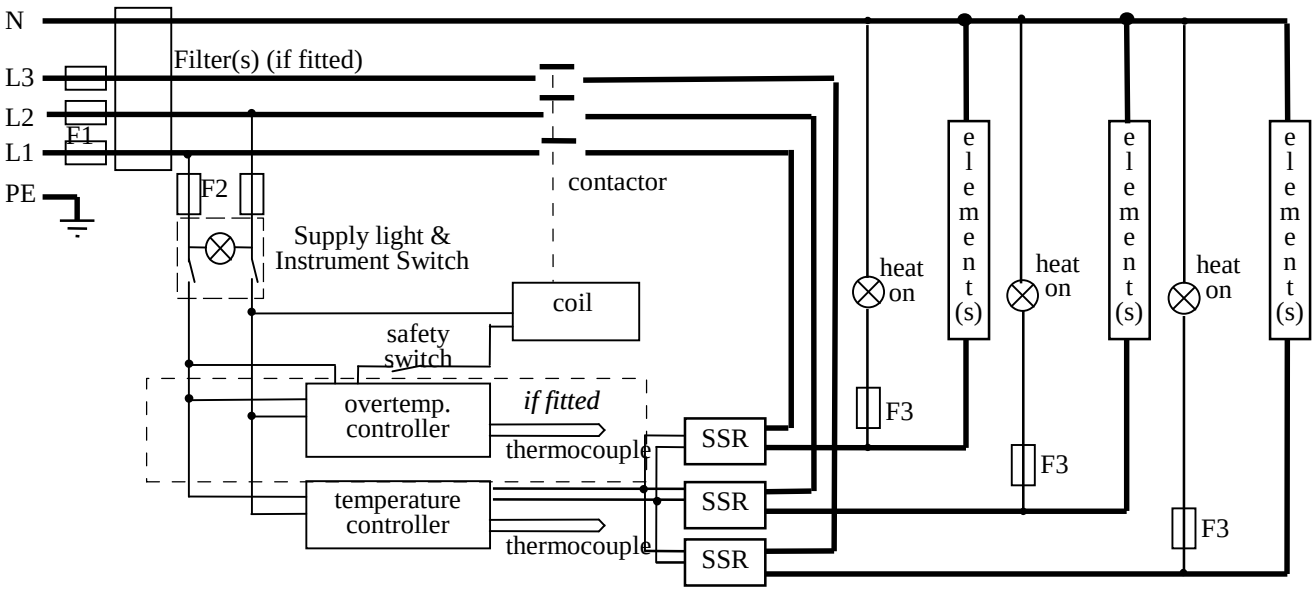
### 7.1 Single Phase

for GPC -/36 see 7.6 and section 2.6




### 7.2 3-phase with neutral

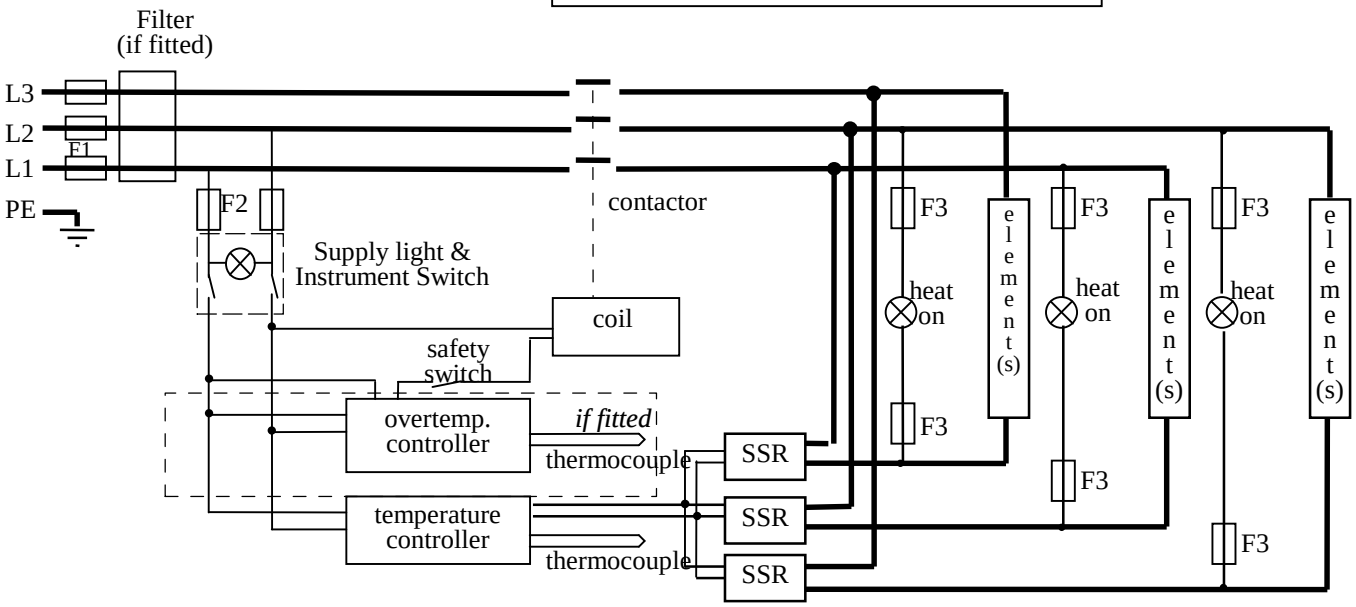
for GPC -/36 see 7.6 and section 2.6



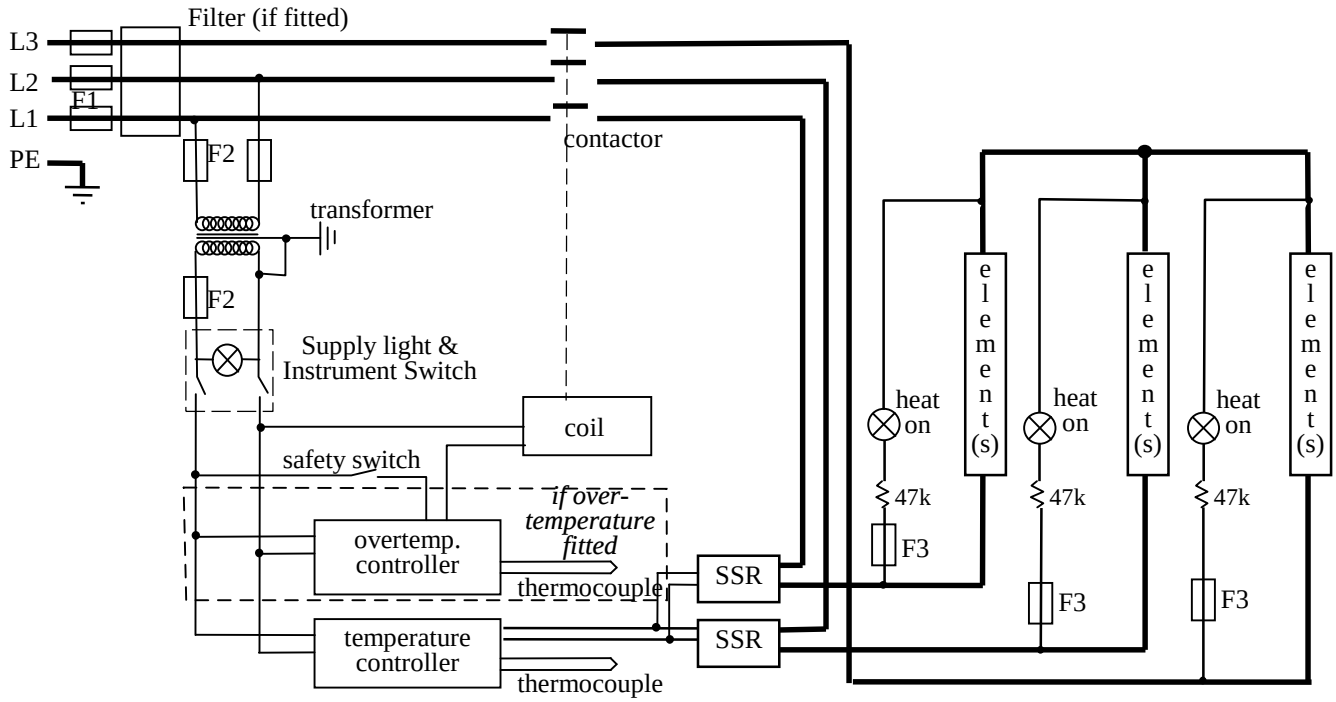

note on 3-phase: depending on filter(s) fitted, there may be 3 separate neutral wires from the elements to the neutral supply.

## 7.3 3-phase without neutral (delta)

for GPC -/36 see 7.6 and section 2.6




## 7.4 3-phase without neutral (star – e.g. 380 to 415V)




Note: in this configuration the fuses F2 on the supply side of the transformer may be GEC Safeclip, not 32 x 6mm glass as stated in section 8.1.

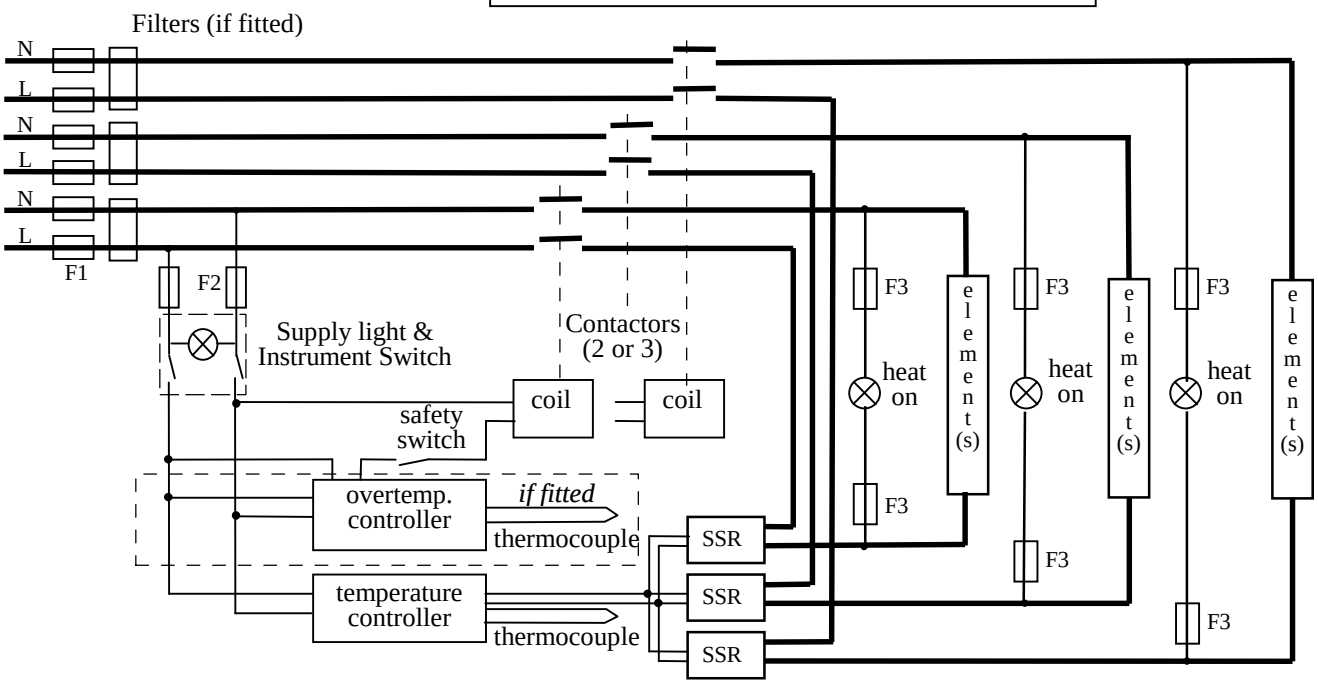
## 7.5 Higher Voltages (e.g. 440V, 480V 3-phase)

The diagram above (0) normally applies, with neutral (if present) not being used.

For single phase models of 254V or above, diagram 7.1 applies except that a control circuit transformer is included as in diagram 0.

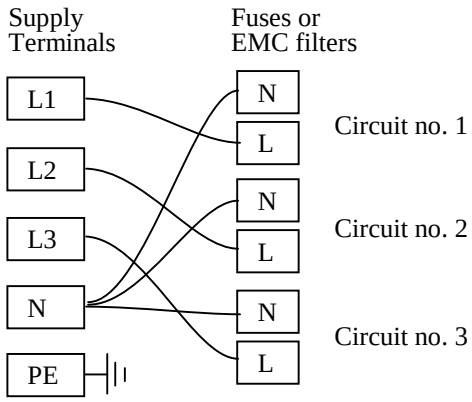
## 7.6 3-phase "universal" wiring

applicable to GPC -/36 - see section 2.6




Fuses F1 are always present in this wiring design.
Fuses F2 could be absent in some circumstances, if the circuit does not exceed 10A.
Fuses F3 are present if the circuit exceeds 25A, but otherwise are usually absent.

### 3-phase + neutral




A model made to this diagram can be converted by the customer between the following supply voltages:

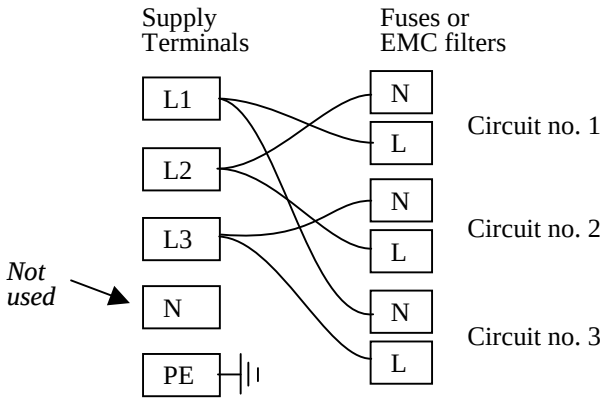
*between* 3-phase + neutral in the range 380/220V – 415/240V

*and* 3-phase delta in the range 220V – 240V

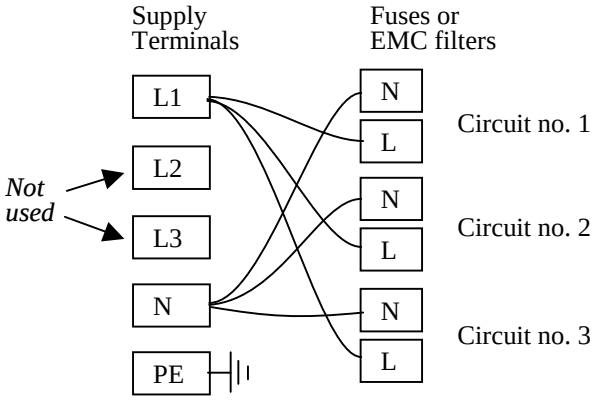
*and* single phase in the range 220V – 240V

*208V model: convertable from 208V delta to 208V 1-phase*

### 3-phase delta




### 1-phase



## 8.0 FUSES & POWER SETTINGS

### *8.1* Fuses *F1-F3: Refer to the circuit diagrams.*

| | | | |
|---|---|---|---|
| *F1* | Internal supply fuses | Fitted if supply cable fitted.<br>Fitted on board to some types of EMC filter. | on-board and up to 16 Amps: 32mm x 6mm type F<br>other: GEC Safeclip |
| *F2* | Auxiliary circuit fuses | Fitted on board to some types of EMC filter.<br>May be omitted up to 25Amp/phase supply rating. | 2 Amps glass type F<br>On board: 20mm x 5mm<br>Other: 32mm x 6mm |
| *F3* | Heat Light fuses | May be omitted up to 25 Amp/phase supply rating. | 2 Amps glass type F<br>32mm x 6mm |
| | **Customer fuses** | Required if no supply cable fitted.<br>Recommended if cable fitted. | See rating label for amperage; see table below for fuse rating. |

| Model | Phases | Volts | Supply Fuse Rating |
|---|---|---|---|
| GPC 12/36, 13/36 | 1-phase | 200 - 240 | 50A |
| GPC 12/36, 13/36 | 3-phase + N | 380/220 - 415/240 | 16A/ph (or 15A) |
| GPC 12/36, 13/36 | 3-phase delta | 200 - 240 | 32A/ph (or 30A) |
| GPC 12/65, 13/65 | 1-phase | 220 - 240 | 63A |
| GPC 12/65, 13/65 | 1-phase | 200 - 208 | 80A |
| GPC 12/65, 13/65 | 3-phase + N | 380/220 - 415/240 | 25A/ph |
| GPC 12/65, 13/65 | 3-phase delta | 220 - 240 | 40A/ph |
| GPC 12/65, 13/65 | 3-phase delta | 200-208 | 40A/ph |
| GPC 12/131, 13/131 | 3-phase+N | 380/220 - 415/240 | 32A/ph (or 30A) |
| GPC 12/131, 13/131 | 3-phase delta | 220 – 240 | 50A/ph |
| GPC 12/200 | 3-phase+N | 380/220 - 415/240 | 40A/ph |
| GPC 12/200 | 3-phase delta | 220 – 240 | 63A/ph |

### 8.2 Power Settings

The power limit settings (parameter OPHi ) for the GPC models on various supply voltages are as follows. The figures represent the maximum percentage of time that controlled power is supplied to the elements. Do not attempt to "improve performance" by setting a value higher than the one from the table.

| Model Volts: | 200V | 208V | 220V | 230V | 240V | 380V | 400V | 415V | 440V | 460V | 480V |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GPC 12/36 | 100 | 96 | 86 | 78 | 72 | 86 | 78 | 72 | 62 | 57 | 52 |
| GPC 12/65 | | | 100 | 92 | 85 | 100 | 92 | 85 | 76 | 70 | 64 |
| GPC 12/131 | | | 100 | 100 | 95 | 100 | 100 | 95 | 84 | 77 | 71 |
| GPC 12/200 | | | 100 | 91 | 83 | 100 | 91 | 83 | 73 | 67 | 62 |
| GPC 13/36 | 100 | 96 | 86 | 78 | 72 | 86 | 78 | 72 | 62 | 57 | 52 |
| GPC 13/65 | | 100 | 100 | 100 | 95 | 100 | 100 | 95 | 84 | 77 | 71 |
| GPC 13/36 USA | 100 | 100 | 90 | 82 | 75 | | | | | | |
| GPC 13/131 | | 100 | 90 | 82 | 75 | 90 | 82 | 75 | 67 | 61 | 56 |

## 9.0 SPECIFICATIONS

*Carbolite reserves the right to change specifications without notice.*

### 9.1 Models Covered by this Manual

| MODEL | Max. Temp. | Max. Power | Chamber Size (mm) | | | Approx. Capacity | Net Weight |
|---|---|---|---|---|---|---|---|
| | (°C) | (kW) | H | W | D | (l) | (kg) |
| *Chamber furnaces heated by resistance wire resting on refractory formers.* | | | | | | | |
| GPC 12/36 | 1200°C | 9 | 250 | 320 | 450 | 36 | 100 |
| GPC 12/65 | 1200°C | 14 | 280 | 390 | 595 | 65 | 165 |
| GPC 12/131 | 1200°C | 18 | 350 | 500 | 700 | 131 | 400 |
| GPC 12/200 | 1200°C | 24 | 400 | 500 | 900 | 198 | |
| GPC 13/36 | 1300°C | 9 | 250 | 320 | 450 | 36 | 100 |
| GPC 13/65 | 1300°C | 14 | 280 | 390 | 595 | 65 | 165 |
| GPC 13/131 | 1300°C | 18 | 350 | 500 | 700 | 131 | 400 |

### 9.2 Environment

The furnaces contain electrical parts and should be stored and used in indoor conditions as follows:

temperature: 5°C - 40°C

relative humidity: maximum 80% up to 31°C decreasing linearly to 50% at 40°C

The products covered in this manual are only a small part of the wide range of ovens, chamber furnaces and tube furnaces manufactured by Carbolite for laboratory and industrial use. For further details of our standard or custom built products please contact us at the address below, or ask your nearest stockist.



CARBOLITE®

Carbolite, Parsons Lane, Hope,
Hope Valley, S33 6RB, England.
**Telephone:** (01433) 620011
Int: +44 1433 620011
**Facsimile:** (01433) 621198
Int: +44 1433 621198
**E-mail:** info@carbolite.com