CARBOLITE GERO 30-3000°C

# Installation, Operation and Maintenance Instructions

1600°C Coal Ash Fusion Furnace - CAF Model: 38mm Ø
No Controller

## CAF 16/38 + No Controller

MEN-CAF1638-005_NOCTRL (13-04-2022)

part of VERDER scientific

## Contents

This manual is for guidance on the use of the Carbolite Gero product specified on the front cover. This manual should be read thoroughly before unpacking and using the furnace or oven. The model details and serial number are shown on the back of this manual. Use the product for the purpose for which it is intended.

# 1.0 Symbols and Warnings

## 1.1 Switches and Lights

Instrument switch: when the instrument switch is operated the temperature control circuit is energised.

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

Heat switch: the switch disconnects power to the heating elements; unless this switch is OFF there is a danger of electric shock when inserting objects into the product.

## 1.2 General Warnings

DANGER – Electric shock. Read any warning printed next to this symbol.

WARNING: Risk of fatal injury.

DANGER – Hot surface. Read any warning printed next to this symbol.

WARNING: All surfaces of a product may be hot.

DANGER – Read any warning printed next to this symbol.


Caution – Double Pole/Neutral Fusing

## 1.3 Hydrogen and Carbon Dioxide Warning

Applicable for furnaces constructed to use $H_2$ and $CO_2$ test gases with $CO_2$ 'Purge' gas.

$H_2$ can form explosive gas mixtures, take precautions to avoid leakage of $H_2$.

$H_2$ and $CO_2$ can react to form CO.

see section 1.4.

Carbon dioxide ($CO_2$) is a colourless, odourless and tasteless gas that is an asphyxiant.

Rapid unconsciousness occurs at levels above 11%, levels of 20 - 30% are immediately hazardous to life.

**Information extracted from Croner Publications Ltd. Substances Hazardous To Health.**

To minimise the risks associated with $CO_2$ it is most important that the product is

installed and operated in accordance with this instruction manual. If the product operator experiences any of the effects listed above, the product must be isolated from the gas and electricity supplies immediately and expert advice sought. For safety guidelines seek the gas manufacturers advice.

## 1.4 Carbon Monoxide Warning

Operation of the CAF furnace involves the use of carbon monoxide.

Carbon monoxide is a product of reaction of $H_2$ and $CO_2$.

Carbon monoxide (CO) is a colourless, odourless, tasteless and inflammable gas which is acutely toxic. CO is introduced into the blood stream through the lungs and binds with the haemoglobin preventing it from carrying oxygen around the body. This can result in rapid damage to body tissues due to oxygen starvation. Since CO is an accumulating toxin it can be dangerous even when present in quite low concentrations over long periods of time. Individuals vary considerably in their reactions to concentrations of toxic gases; table 1 shows the typical effects of cumulative CO exposure.

**Information extracted from Guidance Note EH43 (1996) from the Health and Safety Executive.**

To minimise the risks associated with CO it is most important that the furnace is installed and operated in accordance with this instruction manual. If the furnace operator experiences any of the effects listed above, the furnace must be isolated from the gas and electricity supplies immediately and expert advice sought. For safety guidelines seek the gas manufacturers advice.

**Table 1. Carbon monoxide in air:**

| Parts per million | Effect |
|---|---|
| 50 | Recommended Exposure Limit (8 hours time weighted average concentration) |
| 200 | Headache after approximately 7 hours if resting or after 2 hours exertion |
| 400 | Headache with discomfort with possibility of collapse after 2 hours at rest or 45 minutes exertion. |
| 1200 | Palpitations after 30 minutes at rest or 10 minutes exertion. |
| 2000 | Unconscious after 30 minutes at rest or up to 10 minutes exertion. |

For further information refer to:

- Guidance Note EH43 (1996) from the Health and Safety Executive. ISBN 0 11 883597 1
- EH40/ 2005 Workplace Exposure Limits 2011. ISBN 978 0 7176 6446 7

# 2.0 Installation

## 2.1 Unpacking and Handling

When unpacking and handling the product, always lift it by its base. Do not use the door or any other projecting cover or component to support the equipment when moving it. Use two or more people to carry the product where possible.

Carefully remove any packing material from inside and around the product before use. Avoid damaging the surrounding insulation when removing packing materials.

NOTE: This product contains Refractory Ceramic Fibre (also known as Alumino Silicate Wool - ASW). For precautions and advice on handling this material see section 6.2.

## 2.2 Siting and Setting Up

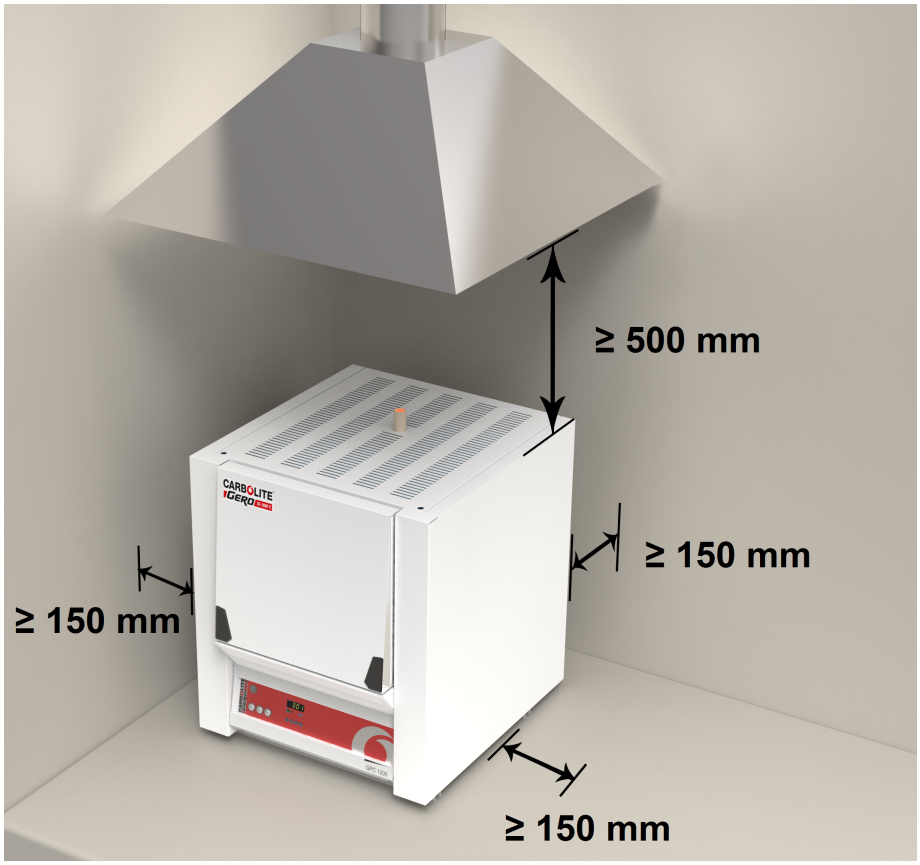
Place the product on a level surface in a well ventilated area.

Site away from other sources of heat and on a non-flammable surface that is resistant to accidental spillage or hot materials.

The surface on which the equipment is mounted should be stable and not subject to movement or vibrations.

The height of the mounting surface is important to avoid operator strain when loading and unloading samples.

Unless otherwise stated elsewhere in this manual, ensure that there is **at least 150 mm** of free space around the back and sides of the product. Clear space is required above the product to dissipate heat.




Depending on the application of the product, it may be appropriate to position it under an extraction hood. Ensure the extraction hood is switched on during use.

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

Under no circumstances should any objects be placed on top of the product. Always ensure that any vents on the top of the product are clear of any obstruction. Always ensure all cooling vents and cooling fans (if fitted) are clear of any obstruction.

## 2.3 Heating Elements

The silicon carbide elements are VERY FRAGILE and are packed separately. Fit them accordingly to the instructions in section 6.0 for element fitting and replacement instructions.

## 2.4 Telescope

The telescope and trunnion arm assembly is packed separately and should be attached to the front of the product before use.

| | |
|---|---|
| • There are four screw holes beneath the furnace opening to allow the telescope and trunnion arm assembly to be fixed to the furnace case. |  |
| • Attach the telescope and trunnion arm assembly using the four screws provided. |  |

## 2.5 Electrical Connections

Connection by a qualified electrician is recommended.

This product requires a single-phase A.C. supply with earth (ground), which may be Live to Neutral non-reversible (polarised), Live to Neutral reversible (non-polarised), or Live to Live.

Check the product rating label before connection. The supply voltage should agree with the voltage on the label and the supply capacity should be sufficient for the current on the label.

The supply should be fused at the next size equal to, or higher than the current on the label. This manual contains a table of the most common fuse ratings.

When the mains cable is factory fitted, internal fuses are also fitted. It is essential that the operator ensures that the product is correctly fused.

Products with a factory fitted supply cable are designed to be wired directly to an isolator or fitted with a line plug.

Products without a factory fitted supply cable require a permanent connection to a fused and isolated supply. The product's electrical access panel should be temporarily removed, and connections made to the internal terminals.

When connecting the product to the power supply, the plug or isolating switch should be accessible, easy to remove, and within reach of the operator.

The supply MUST incorporate an earth (ground).

Electrical Connection Details:

| **Supply** | **Terminal Label** | **Cable Colour** | **Supply Types** | |
|---|---|---|---|---|
| | | | Live - Neutral | Reversible or Live-Live |
| 1-phase | L1 | Brown | to live | to either power conductor<br>(For USA 200-240V, connect L1) |
| | N / L2 | Blue | to neutral | to the other power conductor<br>(For USA 200-240V, connect L2) |
| | PE | Green/ Yellow | to earth (ground) | to earth (ground) |

## 2.6 Gas Connections

The product is fitted with two flow meters, one for Carbon Dioxide ($CO_2$) on the left and the other for Hydrogen ($H_2$) on the right. The output from the flow meters is mixed and taken directly to the work tube through a connection at the front.

There are no valves or non-return devices on this furnace. Regulated supplies of $CO_2$ and $H_2$ must be connected in a safe manner to ensure that all gas flow is through the work tube. The gas supply pressure required is 4 psi (0.276 bar) and must not exceed this.

At the back of the furnace is a copper exhaust vent pipe. The exhaust fumes are dangerous (see "Carbon Monoxide Warning"). The exhaust must be properly vented into a suitable duct or fume cupboard and must not be allowed to contaminate the atmosphere of the room in which the furnace is sited.

## 3.0 Temperature Controller

If this product is fitted with a temperature controller, instructions are provided separately.

# 4.0 Operation

## 4.1 Operating Cycle

This product is fitted with an instrument switch which cuts off power to the control circuit.

Connect the product to the electrical supply.

Turn on the instrument switch to activate the temperature controllers. The controllers illuminate and go through a short test cycle.

**Over-Temperature option only**. If the digital over-temperature option has not yet been set as required, set and activate it according to the over-temperature controller instructions.

The product will heat up according to the controller setpoint or program, unless a time switch is fitted and switched off.

As the product heats up, the heat light glows steadily at first and then flashes as the product approaches the desired temperature. For more information on temperature control see the controller instructions.

**Over-Temperature option only.** If the over-temperature circuit has tripped, an indicator on the over-temperature controller flashes and the heating elements are isolated. Find and correct the cause before resetting the over-temperature controller according to the instructions supplied.

To turn the product off, set the instrument switch to its off position. The controller display will go blank. If the product is to be left unattended, isolate it from the electrical supply.

## 4.2 Setting up for Coal Ash Fusion Test

The CAF 16/38 is designed to be compatible with the following:

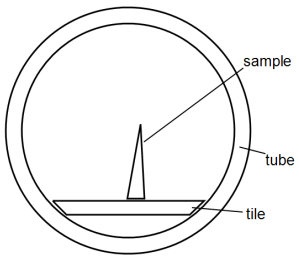
BS 1016 : Part 113 : 1995 ISO 540 : 1995 Methods for Analysis and Testing of Coal and Coke. Part 113. Determination of Ash Fusibility.

The test procedure is entirely manual and under the operator's control. An example of the procedure is as follows:

Heat the product up to its starting temperature.

Open the product door and swing it clear of the work tube to allow access. Load the sample into the work tube. The sample tile with one or two samples on it should be placed centrally along the length of the work tube.

Set the ramp rate on the controller, if required, to limit the heating rate. A rate of 7 °C/ min is suggested and is factory pre-set.




Set the controller to heat the product up to the final temperature. Swing the telescope into place to allow observation of the sample.

Watch the sample and record the temperature at which it fuses. Make all other records such as time and temperature as required by your own organisation.

Switch off and allow to cool down; or set the setpoint to zero or to the normal test starting temperature, so that the temperature is displayed as the furnace cools.

**Note:** Do not operate the product at temperatures above 815 °C (1499 °F) with the door open. The product door must not be left open longer than is necessary to load and unload samples from the work tube.

Sample tiles can be obtained from Carbolite Gero. A brass mould to assist with forming samples is supplied with the product.

## 4.3 General Operating Advice

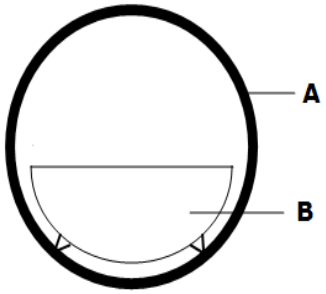
Heating element life is shortened by overheating. Do not leave the product at high temperature when it is not required. The maximum temperature is shown on the product rating label and in section 10.0 towards the back of this manual.

Lightweight ceramic fibre insulation can easily be marked by accidental contact. Some fine cracks may develop in the surface of the insulation due to the progressive shrinkage of the insulation materials. Cracks are not usually detrimental to the functioning or the safety of the product.

## 4.4 Tube Life

A ceramic work tube may crack if work pieces are inserted too quickly or at temperatures below 900 °C (when the tube is more brittle). Large work pieces should also be heated slowly to ensure that large temperature differences do not arise.

Poor thermal contact should be encouraged between the work piece and the tube; crucibles or boats should be of low thermal mass and should have feet to reduce the contact with the tube (fig. 4).




| Key | |
|---|---|
| A | Tube |
| B | Crucible |

*Fig 4 - Avoidance of thermal contact*

Do not set too high a heating or cooling rate. As tubes are susceptible to thermal shock and may break. Tubes which extend beyond the heated part of the furnace are more at risk. A general rule for maximum heating or cooling rate is 400 ÷ internal diameter in mm to give (°C/ min); for 75 mm i/ d tubes this comes to 5 °C per minute. The controller can be set to limit both the heating and cooling rate.

## 4.5 Operator Safety

The ceramic materials used in the product manufacture become electrically conductive to some extent at high temperatures. DO NOT use any conductive tools within the product without isolating it. If a metal work tube is used, it must be earthed (grounded).

Warning: Do not use the product if the work tube is cracked as there is a risk of exposure to carbon monoxide gas. See "Carbon Monoxide Warning"

# 5.0 Maintenance

## 5.1 General Maintenance

Preventive rather than reactive maintenance is recommended. The type and frequency depends on the product use; the following are recommended.

## 5.2 Maintenance Schedule

CUSTOMER
QUALIFIED PERSONNEL

**DANGER! ELECTRIC SHOCK**. Risk of fatal injury. Only electrically qualified personnel should attempt these maintenance procedures.

| Maintenance Procedure | Method | Frequency | | | | |
|---|---|---|---|---|---|---|
| | | Daily | Weekly | Monthly | Bi-Annually | Annually |
| **Safety** | | | | | | |
| Over-Temperature Safety Circuit (if fitted) | Set an over-temperature setpoint lower than the displayed temperature and check for an over-temperature alarm as detailed in this manual | | ■ | | | |
| Over-Temperature Safety Circuit (if fitted) | Electrical measurement | | | | | ● |
| Extraction Pipe | Check that the connection is tight, and clean out the pipe if necessary | | | ■ | | |
| Electrical Safety (external) | Visual check of external cables and plugs | | | ■ | | |
| Electrical Safety (internal) | Physically check all connections and cleaning of the power plate area | | | | | ● |
| Gas Safety (external) | Visually check that all pipework is in place and free of damage. Physically check that all connections are tight | | | ■ | | |
| Gas Safety (internal) | Leak test the gas system | | | | | ● |
| Cooling Fans | Check whether the cooling fans are working | ■ | | | | |
| | | | | | | |
| **Function** | | | | | | |
| Temperature Calibration | Tested using certified equipment, frequency dependent on the standard required | | | ■ | ■ | ● |
| Operational Check | Check that all functions are working normally | ■ | | | | |
| Operational Check | Thorough inspection and report incorporating a test of all functions | | | | | ● |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Performance** | | | | | | |
| Element Circuit | Electrical measurement  | | | | | |
| Power Consumption | Measure the current drawn on each phase / circuit | | | | | |

### 5.2.1 Cleaning

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

The product's 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.

## 5.3 Element Ageing

Silicon carbide elements gradually increase in resistance with use; a process known as ageing. Their heating power reduces correspondingly. To ensure sufficient power to the product, it may be necessary to adjust the power limit and, ultimately, replace the elements - taking care to readjust the power limit.

**Note:** A clamp meter should be used when adjusting the power limit to ensure that the current is not inadvertently increased beyond safe limits. Please contact Carbolite Gero Service for guidance on safe current limits.

Once the heating elements have been in use for some time, they should only be replaced as a set. Single elements may be replaced (in the case of breakage, for example) when the elements are reasonably new.

## 5.4 Calibration

After prolonged use, the controller and/or thermocouple may require recalibration. This is important for processes that require accurate temperature readings or for those that use the product 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 Gero can supply these items.

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

## 5.5 After-Sales Service

Carbolite Gero Service has a team of Service Engineers who can offer repair, calibration and preventive maintenance of furnace and oven products both at the Carbolite Gero factory and at customers' premises throughout the world. A telephone call or email often enables a fault to be diagnosed and the necessary parts to be despatched.

In all correspondence please quote the serial number and model type given on the rating label of the product. The serial number and model type are also given on the back of this manual when supplied with the product.

Carbolite Gero Service and Carbolite Gero contact information can be found on the back page of this manual.

## 5.6 Recommended Spare Parts and Spare Parts Kit

Carbolite Gero can supply individual spare parts 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 consists of a thermocouple and sheath, a solid state relay, a set of heating elements and a set of clips and braids.

When ordering spare parts please quote the model details as requested above.

# 6.0 Repairs and Replacements

## 6.1 Safety Warning - Disconnection from Power Supply

Immediately switch the product off in the event of unforeseen circumstances (e.g. large amount of smoke). Allow the product to return to room temperature before inspection.

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

**Caution**: Double pole/neutral fusing may be used in this product.

## 6.2 Safety Warning - Refractory Fibre Insulation

**Insulation made from High Temperature Insulation Wool**

**Refractory Ceramic Fibre, better known as (Alumina silicate wool - ASW).**

This product contains **alumino silicate wool** products in its thermal insulation. These materials may be in the form of blanket or felt, formed board or shapes, slab or loose fill wool.

Typical use 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, it is strongly recommended that safety precautions are taken whenever the materials are handled.

**Exposure to fibre dust may cause respiratory disease.**

**When handling the material, always use approved respiratory protection equipment (RPE-eg. FFP3), eye protection, gloves and long sleeved clothing.**

**Avoid breaking up waste material. Dispose of waste 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 it is recommended to make reference to the European Association representing the High Temperature Insulation Wool industry (www.ecfia.eu).

Further information can be provided on request. Alternatively, Carbolite Gero Service can quote for any repairs to be carried out either on site or at the Carbolite Gero factory.

## 6.3 Temperature Controller Replacement

Refer to the controller instructions for more information on how to replace the temperature controller.

## 6.4 Solid-State Relay Replacement

Disconnect the product from the power supply and remove the appropriate cover as given above.

1. Make a note of the wire connections to the solid state relay, then disconnect them.
2. Remove the solid state relay from the base panel or aluminium plate.
3. Replace and reconnect the solid state relay ensuring that the bottom of it has good thermal contact with the base panel or aluminium plate.
4. Replace the access panel.

## 6.5 Thermocouple Replacement

Disconnect the product from the power supply. Remove the appropriate panel to gain access to the thermocouple connections. Make a note of the thermocouple connections.

Thermocouple cable colour codings are:

| **thermocouple leg** | **colour** |
|---|---|
| positive (type R) | orange |
| negative | white |

Disconnect the thermocouple from its terminal block; retain any porcelain spacers.

Withdraw the thermocouple from its sheath and remove any broken bits of thermocouple.

Re-assemble with a new thermocouple observing the colour coding.

Refit the element access panel.

## 6.6 Element Replacement

Disconnect the product from the electrical supply.

Remove the complete front panel. Remove the thermocouple cover and the square plate from the back panel.

The elements are expensive and fragile and can be damaged by contamination: handle them with care and keep them clean.

Replacements only: make a note of the actual braid and cable connections to the elements. Disconnect the clips with the special tool provided (or with finger pressure, depending on the type of clips supplied), lift off the braids and carefully withdraw each element. See fig. 5.

Carefully insert the new elements into the product.

Attach the connection braids according to the note made above or to the appropriate diagram, fig. 6. Use the special tool (or finger pressure) to fit the clips. Take care that adjacent clips do not touch each other.

Replace the product end panels and connect the product to the electrical supply.

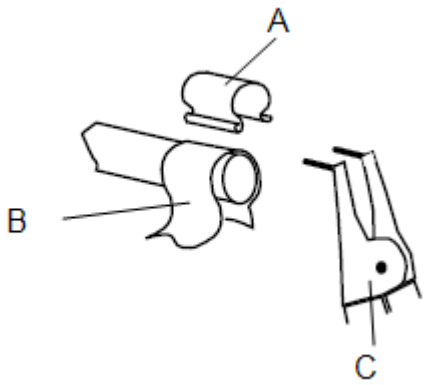



**Fig.5. - Use of Clip Tool**

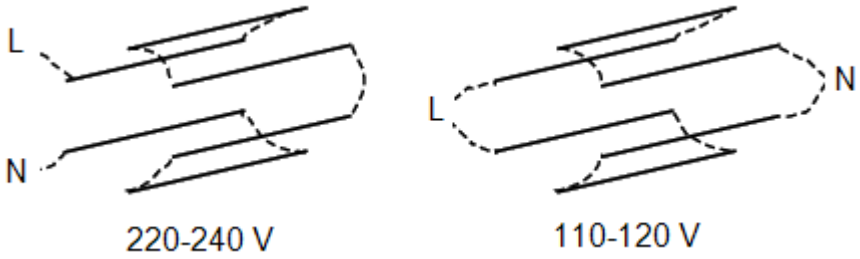



**Fig.6. Element Connections**

## 6.7 Fuse Replacement

Fuses are marked on the wiring diagram with type codes, e.g. F1, F2. For more information on fuses refer to section 9.0.

*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 Gero.

The fuses are located at the cable entry point. Remove the back panel or control box back panel to gain access to the fuses.

## 7.0 Fault Analysis

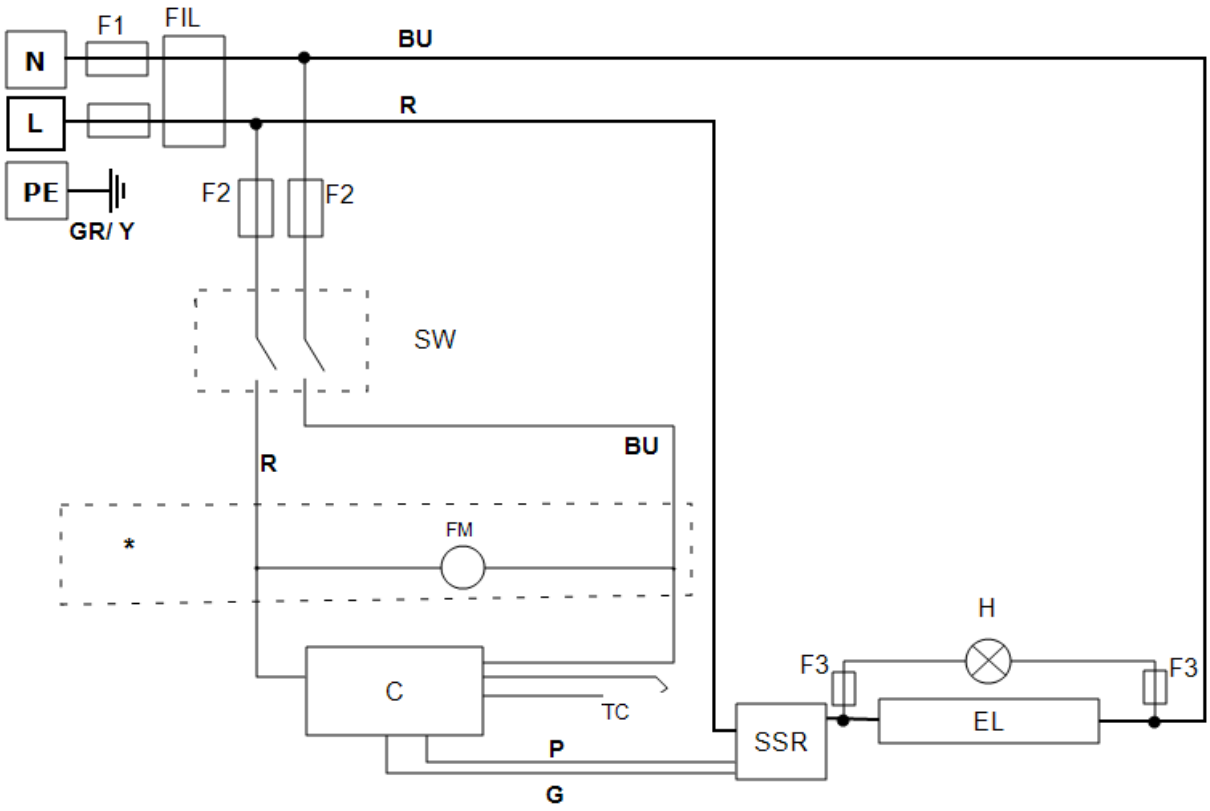
| A. Furnace Does Not Heat Up | | | | | |
|---|---|---|---|---|---|
| 1. | The HEAT light is ON | ▶ | The heating element has failed | ▶ | Check also that the SSR is working correctly |
| 2. | The HEAT light is OFF | ▶ | The controller shows a very high temperature or code such as S.br | ▶ | The thermocouple 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/relay (if fitted) may be faulty |
| | | | | ▶ | The heater switch (if fitted) may be faulty or need adjustment |
| | | | | ▶ | 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 | ▶ | Check the supply fuses and any fuses in the furnace control compartment |
| | | | | ▶ | The controller may be faulty or not receiving a supply due to a faulty switch or a wiring fault. |

| B. Product Overheats | | | | | |
|---|---|---|---|---|---|
| 1. | Product only heats up when the instrument switch is ON | ▶ | The controller shows a very high temperature | ▶ | The controller is faulty |
| | | ▶ | The controller shows a low temperature | ▶ | The thermocouple may be faulty or may have been removed out of the heating chamber |
| | | | | ▶ | The thermocouple may be connected the wrong way around |
| | | | | ▶ | The controller may be faulty |
| 2. | Product heats up when the instrument switch is OFF | ▶ | The SSR has failed "ON" | ▶ | Check for an accidental wiring fault that could have overloaded the SSR |

# 8.0 Wiring Diagrams

## 8.1 WA-11-00

Connections below show single phase.

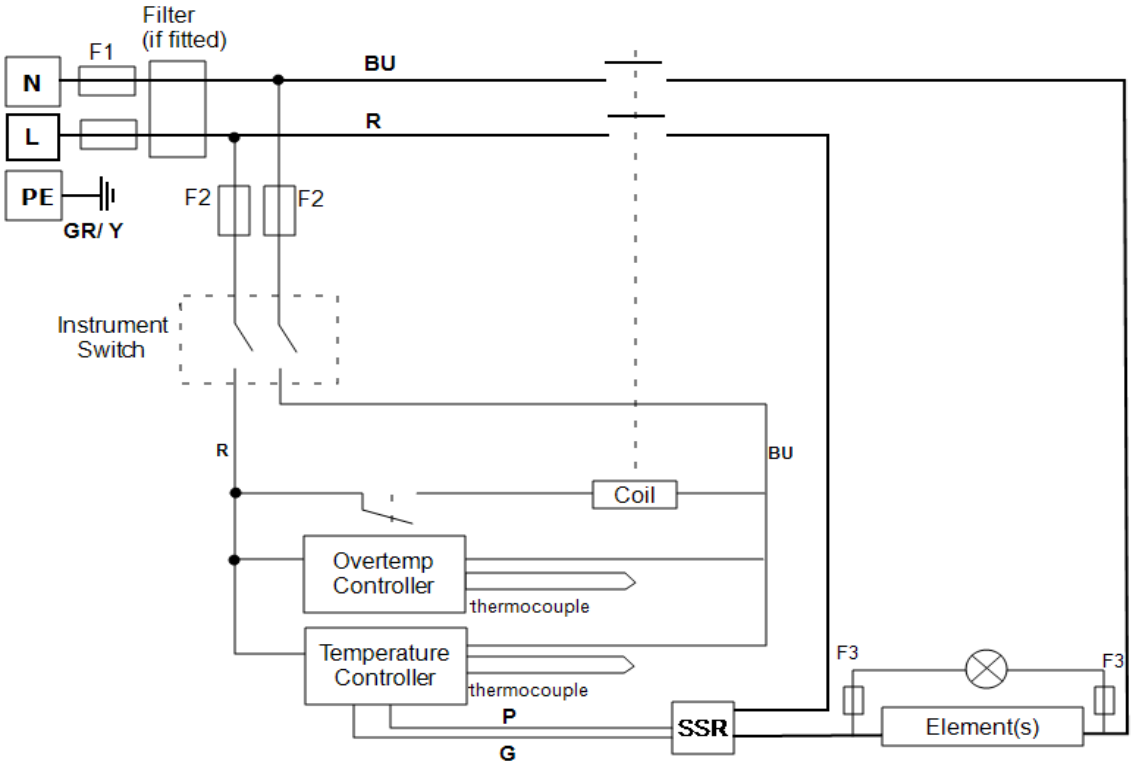



| Key | |
|---|---|
| F1, F2, F3 | Fuses |
| FIL | Filter |
| C | Temperature Controller |
| TC | Control Thermocouple |
| SSR | Solid State Relay |
| H | Heat Lamp |
| EL | Element(s) |
| SW | Instrument Switch(es) |
| FM | Fan Motor |
| * | Fan Models Only |
| N | Neutral |
| L | Live |
| PE | Earth |

| Cables | |
|---|---|
| BU | Blue |
| R | Red |
| GR/Y | Green + Yellow |
| G | Grey |
| P | Pink |

## 8.2 WA-11-01

Connections below show single phase with over-temperature controller.



# 9.0 Fuses and Power Settings

## 9.1 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. | 38 mm x 10 mm type F fitted on EMC filter circuit board(s) |
| F2 | Auxiliary Circuit Fuses | Fitted on board to some types of EMC filter.<br>May be omitted up to 25 Amp/ phase supply rating. | 2 Amps glass type F<br>On board: 20 mm x 5 mm<br>Other: 32 mm x 6 mm |
| F3 | Heat Light Fuses | May be omitted up to 25 Amp/ phase supply rating. | 2 Amps glass type F<br>32 mm x 6 mm |
| | Customer Fuses | Required if no supply cable fitted.<br>Recommended if cable fitted. | See rating label for current;<br>See table below for fuse rating. |

| Model | Phases | Volts | Supply Fuse Rating |
|---|---|---|---|
| CAF 16/38 | 1-phase | 110-120 | 63 A |
| CAF 16/38 | 1-phase | 220-240 | 25 A |

## 9.2 Power Settings

The setting for the power limit parameter in the controller (OP.Hi) should be 100% for the model listed in this manual.

Please refer to the rating label for product specific information.

# 10.0 Specifications

*Carbolite Gero reserves the right to change the specification without notice.*

| Model | Max Temp (°C) | Max Power (kW) | Internal Bore (mm) | Net Weight (kg) |
|---|---|---|---|---|
| Coal Ash Fusion Testing Furnace | | | | |
| CAF 16/38 | 1600 | 4.5 | 38 | 67 |

## 10.1 Environment

The models listed in this manual 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 |

# Notes

## Service Record

| Engineer Name | Date | Record of Work |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |


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 Gero 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.

For preventive maintenance, repair and calibration of all furnace and oven products, please contact:

**Carbolite Gero Service**

Telephone: + 44 (0) 1433 624242

Fax: +44 (0) 1433 624243

Email: ServiceUK@carbolite-gero.com

**Carbolite Gero Ltd,**

Parsons Lane, Hope, Hope Valley, S33 6RB, England.

Telephone: + 44 (0) 1433 620011

Fax: + 44 (0) 1433 621198

Email: Info@carbolite-gero.com

www.carbolite-gero.com