

Installation, Operation and Maintenance Instructions

800°C Afterburner Ashing Furnace - ABA Model: 28 Litres
No Controller

ABF 8/28 + No Controller

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.

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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.

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 Access to the Plenum Chamber



Soot can accumulate in the airway following the after-burner, giving rise to fire risk.

There is a plenum chamber with removable panels to give access to cleaning; see section 6.3.

The operator is responsible for maintaining a clean plenum chamber and also for regular cleaning of the chimney and the external flue or ducting system.

1.4 Maintenance or Dismantling



The operator should read the warning on refractory fibre insulation, given in section 7.2, before undertaking any work involving exposure to the internal insulation material.

The operator should disconnect the equipment from the electrical supply before removing panels to access the electrical connections and control equipment.

2.0 Supplied Items List

2.1 Parts Supplied

The following items should be present. These should all be checked and identified as soon as possible after receipt of the equipment.

quantity	item
1	Afterburner Ashing Furnace: ABF 8/28
1	Chimney
1	Basket Set
1	Basket Set loading handle
(1)	Stand (only if ordered)

In addition, any spare parts ordered should be separately identified and put aside in safe storage.

2.2 Tools Required

10 mm spanner, 12 mm spanner, cross point screwdriver, flat blade screwdriver.

3.0 Installation

3.1 Unpacking & Handling

When unpacking or moving the product, always lift by its base; do not use the door or any other projecting cover or component to support the equipment when moving it. Use a fork lift or pallet truck to move the product; position the product on a level surface and use an adequate number of personnel to safely move the product into position.

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 7.2.

3.2 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.

3.3 Fitting the Chimney

- Remove the chimney panel, (see Fig 10.)
- Fasten the chimney to the top of the product using the screws provided, (see Fig 12.)
- Replace the chimney panel, (see Fig 11.)

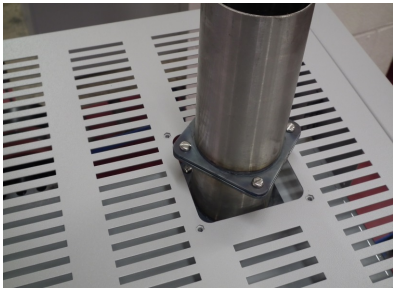


Fig 10 - Remove the chimney panel

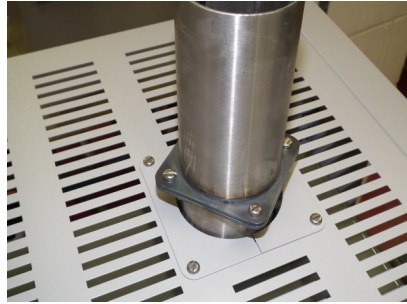


Fig 11 - Replace the chimney panel



Fig 12 - Chimney screws

3.4 Ducting

The chimney must either be placed under a powered exhaust hood, or connected directly to a 76 mm duct (not supplied) to the outside of the building; any such duct must NOT have powered extraction.

The fumes should be ducted by either of the above methods to at least 1 metre above the level of the building.

Rules for ducting:

- Ducting diameter must be 76 mm or more.
- Ducting must be 76 mm where it connects to the chimney.
- Ducting length must not exceed 3 metre for 76 mm diameter; for longer lengths consult a ducting engineer.
- Flexible ducting, if used, must be suitable for exhaust gas extraction.
- If an extraction fan is fitted an extraction hood is required with free flow of air around the chimney.
- Do not connect more than one product to a single duct. (Exception: where a fanned duct with hoods is used)

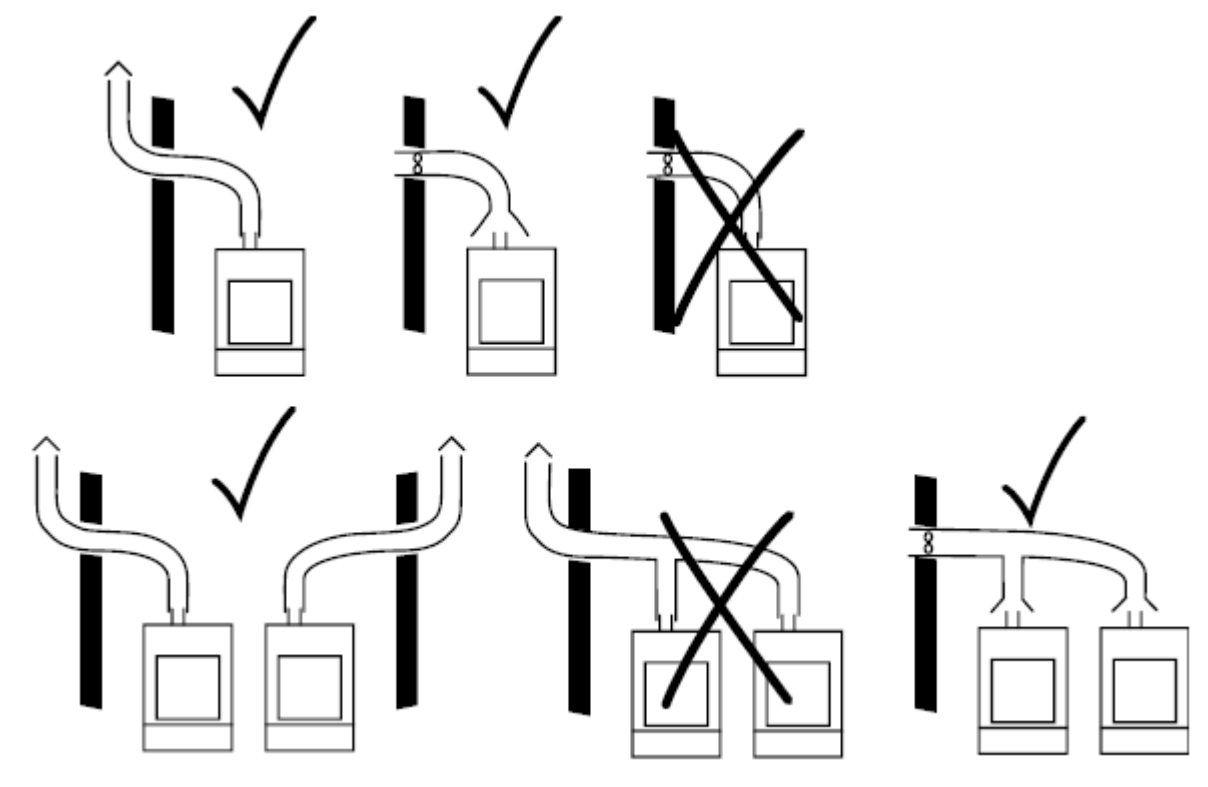


Fig 13 - Ducting Schematic

3.5 Electrical Connections



Connection by a qualified electrician is recommended.

For electrical connection details of the ABF 8/28 refer to drawing 00348-1-5003

Look at the rating label before connection to check the electrical supply voltage and frequency for which the product is configured. If there is a difference between the actual supply and the rating label, please call Carbolite Gero.

Either wire directly to an isolator or fit with a line plug. An isolating switch should operate on all live conductors (three phase); it should be within reach of the operator. A line plug should be easily removable and should be within reach of the operator.

The electrical supply **MUST** incorporate an earth (ground).



Failure to wire to the appropriate diagram may damage the ABF.

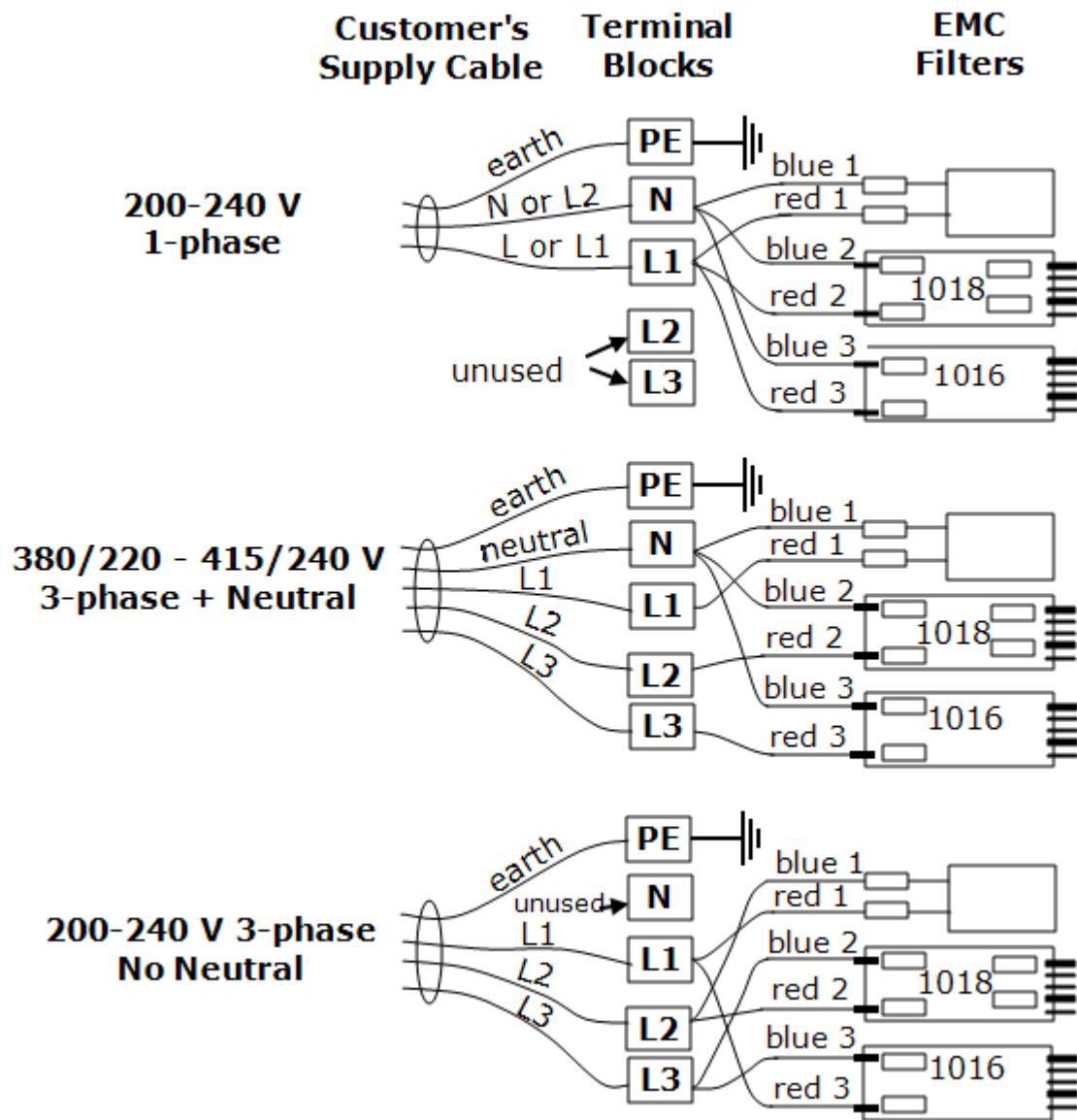


Fig 14 - Schematic for Mains Electrical Connections

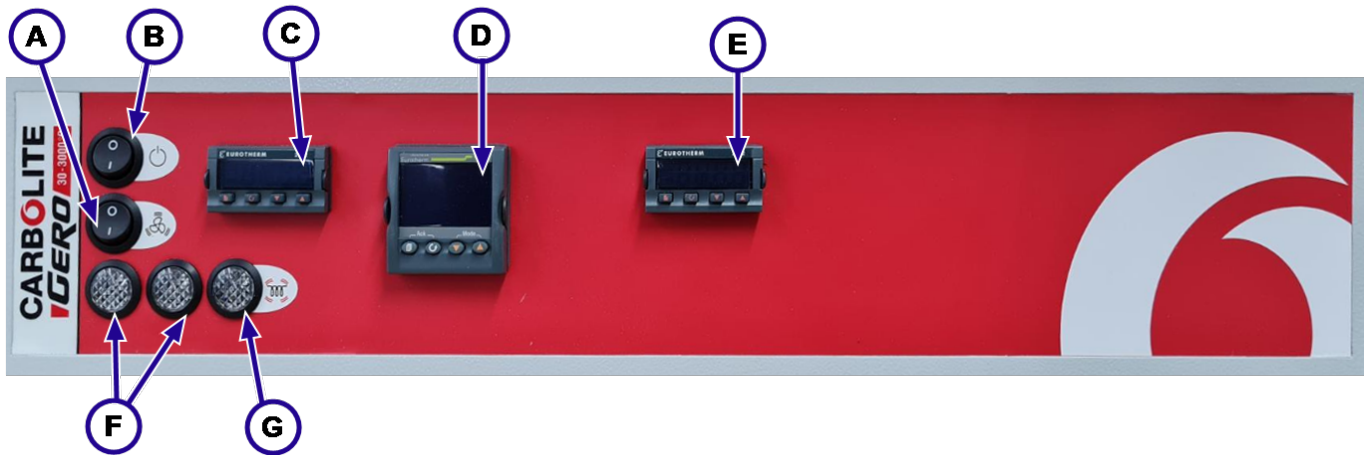
4.0 Temperature Controller

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

5.0 Operation

5.1 Switches - Control Panel

The main control switches are on the left hand side of the control panel (photo 3.1).



A	Extraction fan switch
B	Instrument switch
C	Main furnace chamber over-temperature controller
D	Main chamber temperature controller
E	Afterburner controller
F	Heater lamps (main chamber)
G	Heater lamps (afterburner)

The Instrument Switch cuts off power to the controllers, other devices (including the fan), and heating circuit contactors.

Note: Models ordered with a CC-T1 controller will feature one touchscreen interface on the control panel instead of three separate controllers.

5.2 General Operating Notes



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 11.0 towards the back 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 elements. However, if a large object is placed in the chamber it may record the average temperature of the object and the elements, this 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, or heat using a slowly controlled ramp rate. For more information refer to the controller instructions.

When heating materials that produce smoke or fumes, the chimney must be correctly fitted and unobstructed. If not, soot will accumulate in the chamber and could possibly cause an electrical breakdown of the heating element. If the furnace is used to heat materials that emit smoke or fumes, regularly heat it up to maximum temperature for one hour with the chamber empty to burn away the soot.

The product has been designed for ashing items that containing no more than 40 g of carbon.

Baskets are provided with a loading handle. These can be used to load and unload the items being ashed. Make sure a safe surface is available, which must not be flammable, available to place the basket when unloading.

5.3 Operator Safety



This product incorporates a safety switch which interrupts the heating element circuit when the furnace is opened. This prevents the operator touching a live heating element and also prevents the product from heating up if the furnace is left open. The operation of this switch should be checked periodically.



Depending on use, the surfaces in the working chamber and the chamber load may still be very hot after the appliance is switched off. Touching these surfaces may cause burns. Use suitable personal protective equipment or wait until the appliance cools down to ambient temperature.

Before removing a hot object from the product, make sure there is a safe place to put it down. If necessary use tongs, face masks and heat resistant gloves. Heat resistant clothing and face protection can guard against the effects of radiated heat when the furnace is open.



Do not open the product door during an ashing procedure as combustion will be taking place within the chamber.

5.4 Temperature Control

The ABF is fitted with a main controller, an afterburner controller, and an element over-temperature controller. The instructions for all controllers are provided separately.

The main controller is programmed with a maximum temperature of 800 °C, whilst the afterburner controller is programmed with a maximum temperature of 950 °C.

The heating element over-temperature controller is mounted inside the furnace and has a set temperature of 900 °C. This controller automatically switches off the elements when the element chamber gets too hot and then switches back on. The element over-temperature controller is fitted as additional protection for the heating elements. This over-temperature is self resetting and should not need any user adjustment. It is accessed by removing the back panel – see item **A** in photo 3.5 below:

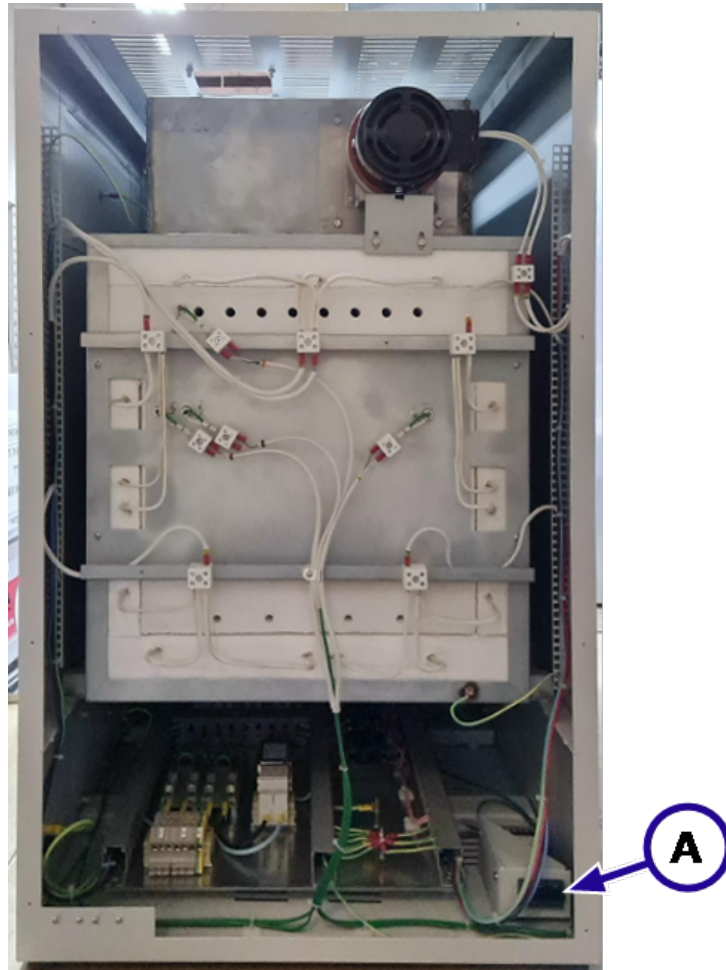


Photo 3.5

6.0 Maintenance

6.1 General Maintenance

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



6.2 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						
Safety Switch Function	Set a safe temperature above ambient, and open the door to see if the heater light goes out					
Safety Switch Function	Electrical measurement 					
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 					
Door Plug	Visual inspection, checking the seal and whether it is free of damage					
Door Plug	Replacement where necessary					
Chimney / Extraction	Check and clean 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					
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					6
Performance						
Element Circuit	Electrical measurement 					6
Power Consumption	Measure the current drawn on each phase / circuit					6
Hearth	Visual check for fit and damage					
Cooling Fans (if fitted)	Check whether the cooling fans are working					

6.2.1 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.

6.3 Cleaning the Plenum Chamber & Fan Impeller

Remove the upper side access panel and the cover of the plenum chamber (see Fig 75. and Fig 76.). Clean out all accumulated soot and debris using a vacuum cleaner. Also clean any accumulated soot and debris from the fan impeller located at the back of the plenum chamber. If the accumulation of soot on the impeller is significant, it may be necessary to remove the motor/ impeller assembly from the back of the plenum chamber to give good access for cleaning.

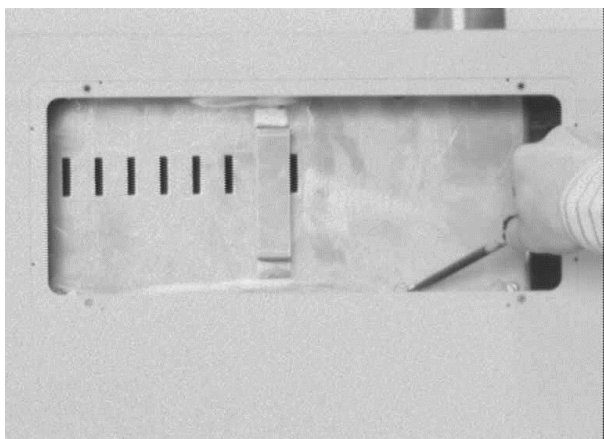


Fig 75 - Access to the Plenum Chamber

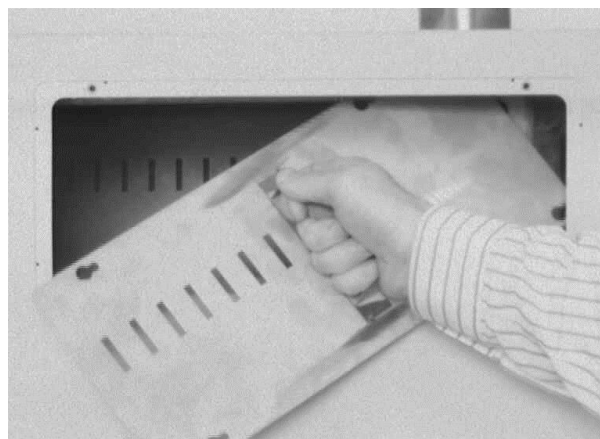


Fig 76 - Plenum Chamber Access Panel

6.4 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.

6.5 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.

6.6 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.

Please consult Carbolite Gero's Sales Department for details of recommended spare parts.

7.0 Repairs and Replacements

7.1 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.

7.2 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.

7.3 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.

7.4 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 K)	green
negative	white

Disconnect the thermocouple from its terminal block and withdraw the thermocouple from its sheath by bending the metal tag or releasing the screw to release. It is also advisable to remove the sheath and shake out any broken pieces 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 metal tag is bent back to grip the sheath.

Refit the element access panel.

7.5 Element Replacement

If the elements should need replacing a complete insulation assembly or a new insulated chamber will be supplied.

7.6 Door Plug Replacement

Contact Carbolite Gero Service Department should this need replacing.

8.0 Fault Analysis

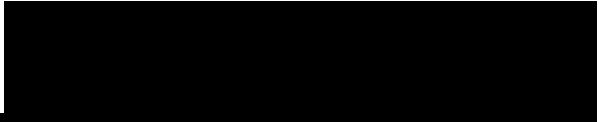
A. Furnace Does Not Heat Up					
1.	The HEAT light is ON	▶	The heating element has failed	▶	Check also that the SSR is working correctly
2.	The HEAT light is OFF	▶	The controller shows a very high temperature or code such as S.br	▶	The thermocouple has broken or has a wiring fault
		▶	The controller 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

C. Furnace Slow to Heat Up

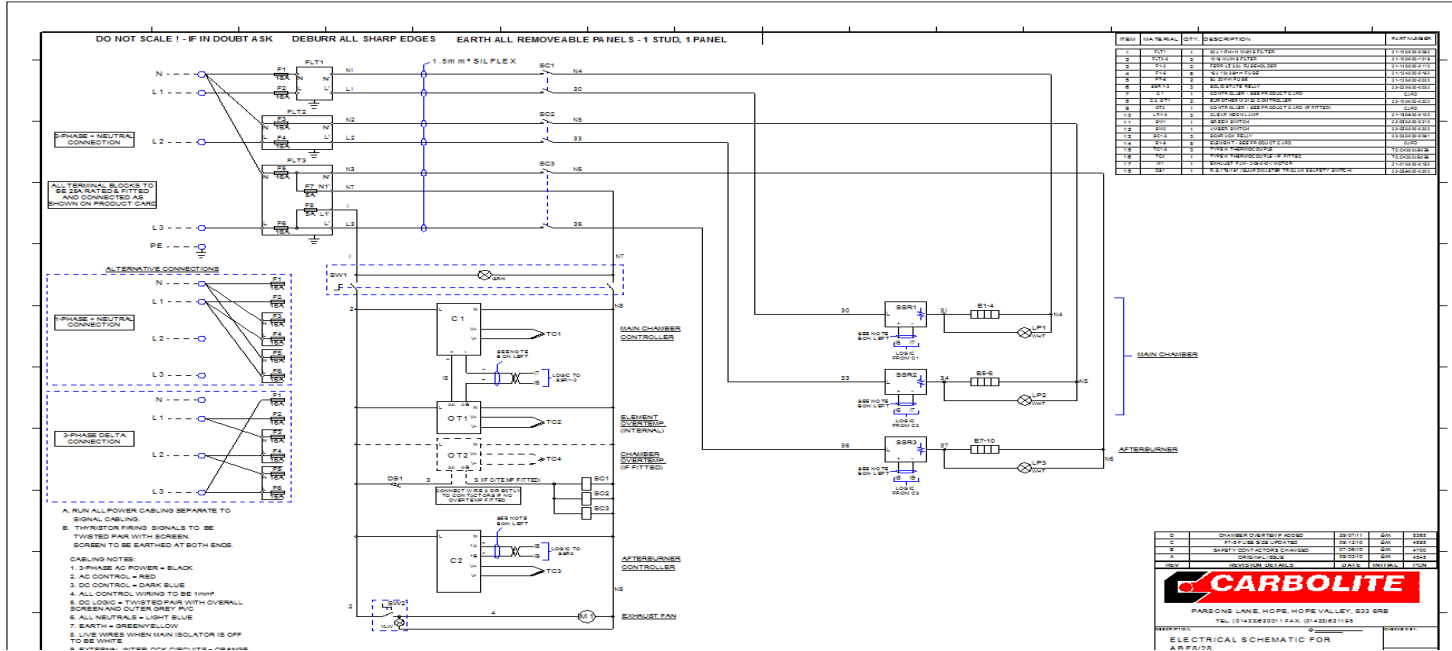
1.	One of the Heat lights does not light up	▶	A fuse may have blown	▶	Check the Supply fuses
2.	The heat lights all light up	▶	An element may have failed		



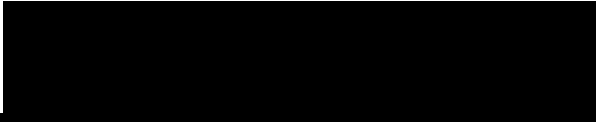
D. Chimney Emits Smoke					
1.	Some light smoke is emitted in the middle of the test	▶	No fault		
2.	Dense smoke is emitted	▶	The after-burner chamber temperature may not be set high enough	▶	Set the secondary controller temperature to 900 °C
		▶	The after-burner elements or control may have failed	▶	Investigate or contact Carbolite Gero
		▶	A fuse may have blown	▶	Check the supply fuses
		▶	A Load containing too much carbon has been loaded	▶	Reduce the size of the load. set a much slower heating rate-see temperature control instructions

9.0 Wiring Diagrams

9.1 00348-1-5003-D



A full size wiring diagram is available on request. Please contact Carbolite Gero Service.



10.0 Fuses and Power Settings

10.1 Fuses

The following fuses are present:

Supply Fuses: 38 mm x 10 mm type F, 16 A - 6 total

Auxiliary Fuses 20 mm x 5 mm glass type F, 5 A

10.2 Customer Supply Fusing

High break capacity fuses should be used. Avoid fast-blow fuses and magnetic trip circuit breakers - consult Carbolite Gero if in doubt.

The supply fuse rating should be as follows:

Phases/ Volts	Supply Fuse Rating
3-phase with neutral, 380/ 220 V to 415/ 240 V	16 A per phase

10.3 Power Settings

The furnace control system incorporates electronic power control, including a "power limit" parameter that is used to reduce the effective voltage to 208 V (or 104 V); the values of the power limit for different voltages are as follows:

ABF 8/28	Voltage	200 V	208 V	220 V/ 380 V	230 V/ 400 V	240 V/ 415 V
	Power (%)	100	92	83	76	69

Please refer to the rating label for product specific information.

11.0 Specifications

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

Carbolite Gero model ABF 8/28, Afterburner Ashing Furnace.

Height without Chimney	980 mm
Height with Chimney	1160 mm
Width	600 mm
Depth (length)	750 mm
Optional Stand	600 mm high
Weight	120 kg (approximately)
Power Rating	8000 Watts
Maximum Temperature	800 °C

11.1 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

ProductLabel

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:

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