

# CARBOLITE®

## Installation, Operating & Maintenance Instructions

### After Burner Ashing Furnace

Model ABF 8/28

This manual is for the guidance of operators of the above Carbolite product and must be read before the equipment is connected to the electricity supply.

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**Manuals are supplied separately for the furnace controllers**

## SUPPLIED ITEMS LIST

### Parts Supplied

The following items should be present. These should all be checked and identified as soon as possible after receipt of the equipment. The next page shows pictures of many of the parts for identification purposes.

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.

## **SAFETY FEATURES**

*In this section the word “user” is to be interpreted as any person with access to or responsibility for the ABF 8/28 and its ancillary equipment.*

### **1.0 SYMBOLS & WARNINGS**

#### **1.1 Switches and Lights**

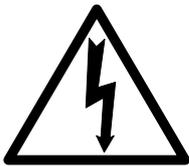


Instrument switch: when the instrument switch is operated the temperature control circuit is energised.



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

#### **1.2 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.

#### **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 4.2.

The user 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 user should read the warning on refractory fibrous insulation, given in section 4.0, before undertaking any work involving exposure to the internal insulation material.

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

## 2.0 ABF INSTALLATION

### 2.1 Tools Required

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

### 2.2 Unpacking, Handling & Siting

When unpacking and moving the ABF always lift it by its base; never lift it by the door or any other protruding part.

Remove any packing material from the chamber before use.

NOTE: This product contains **Refractory Ceramic Fibre** (better described as **Alumino Silicate Wool**) for precautions and advice in handling this material see the 'Repairs and Replacements' section.



Install the ABF 8/28 in a well ventilated room, ideally away from sources of dust. The surface on which the equipment is mounted should be resistant to accidental spillage of hot materials and must not be inflammable. The surface should be stable and not subject to movement or vibration. If the optional metal stand is supplied, this is best placed on a solid (concrete) floor.

The height of the mounting surface is important to avoid operator strain when loading and unloading samples. A surface height of about 600mm is recommended to give a sample loading height of about 960mm.

Ensure that there is free space around the ABF. Do not obstruct any of the vents in the case: they are needed to keep the controls and the case exterior cool.

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

### 2.3 Fitting the Chimney

- Remove the split chimney panel (photo 2.2).
- Fasten the chimney to the top of the ABF using the screws provided (photo 2.1 & 2.3).
- Replace the split chimney panel (photo 2.2).

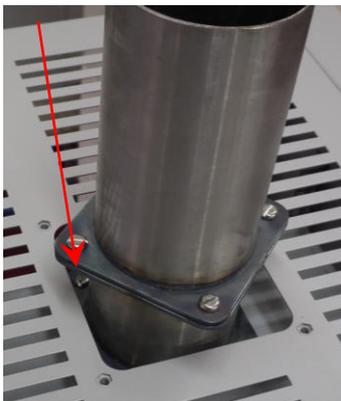


Photo 2.1 - fastening the chimney



Photo 2.2 - replacing the panel



Photo 2.3 - screws

## 2.4 Ducting

The chimney must either be placed under a powered exhaust hood, or connected directly to a 76mm 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 1m above the level of the building.

Rules for ducting:

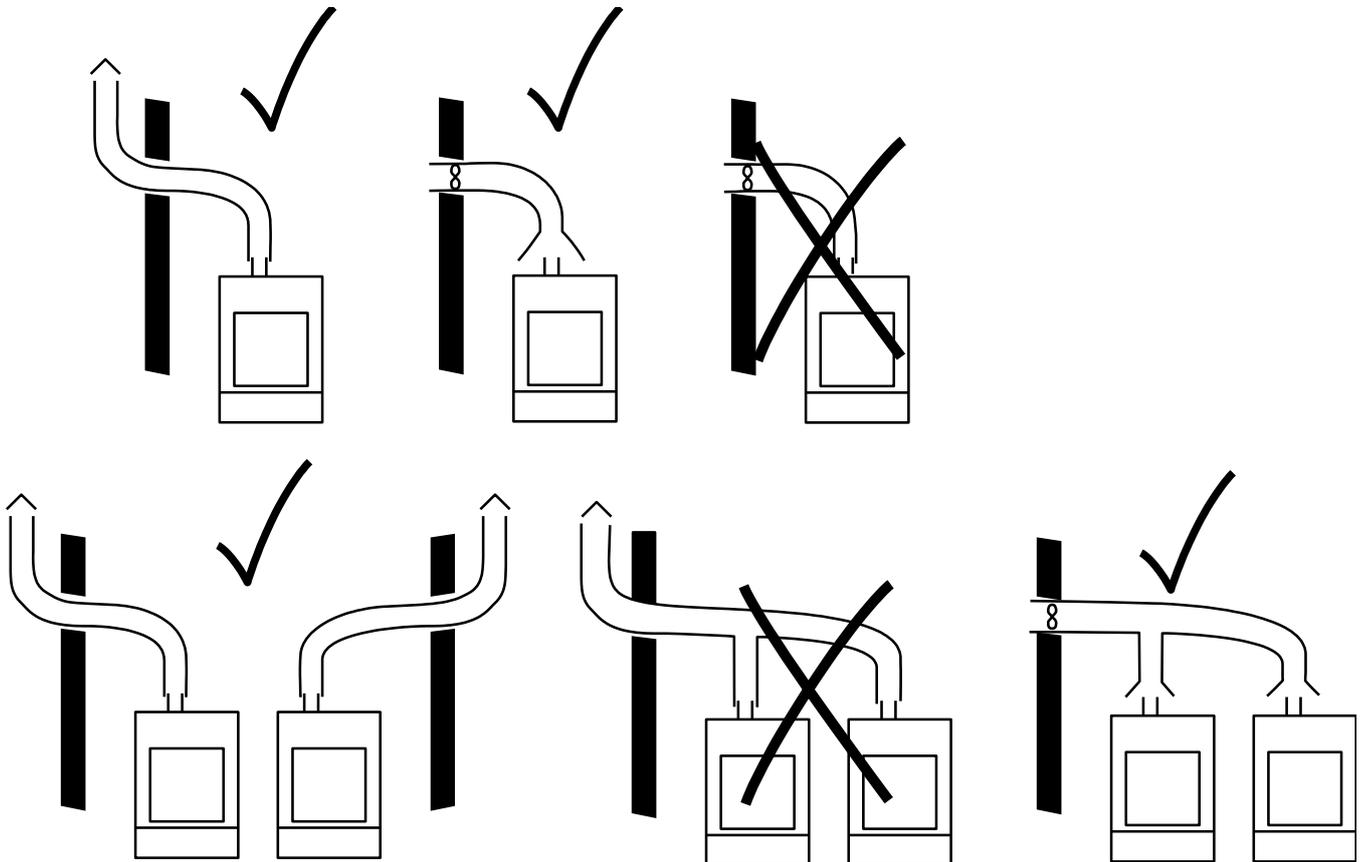
Ducting diameter must be 76mm or more. Ducting must be 76mm where it connects to the chimney.

Ducting length must not exceed 3m for 76mm 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 unit to a single duct. Exception: fanned duct with hoods.



## 2.5 Electrical Connections

*Connection by a qualified electrician is recommended.*

Model ABF 8/28 should be connected to drawing 00348-1-5003

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



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

### 3.0 ABF OPERATION

This section describes how to heat the chamber up to temperature,

#### 3.1 Switches – Control Panel

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

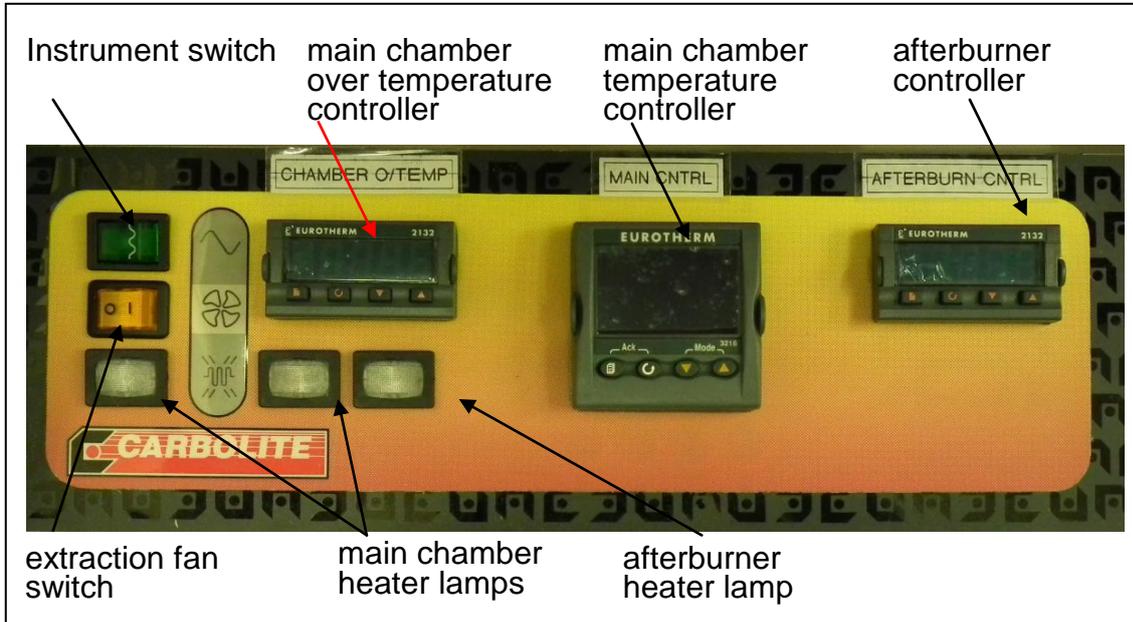


Photo 3.1

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

#### 3.2 General Operating Notes

Heating element life is shortened by use at temperatures close to maximum. Do not leave the ABF at high temperature when not required. The maximum temperature for the main chamber is 800°C, and for the after burner 950°C.

Light weight ceramic fibre insulation can easily be marked by accidental contact. Some fine cracks may be visible on the surface of the insulation, or may develop in the surface of the chamber due to the progressive shrinkage of the insulation materials. Cracks are not usually detrimental to the functioning or the safety of the furnace.



The chimney and extraction ducting should always be correctly fitted and unobstructed: see sections 2.3 & 2.4.



See sections 4.1 and 4.2 for information about maintenance.

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

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

#### 3.1 Operator Safety



The ABF incorporates a safety switch which interrupts the heating element circuit when the door is opened.



Wear appropriate safety clothing: gloves, a mask and safety glasses are recommended.



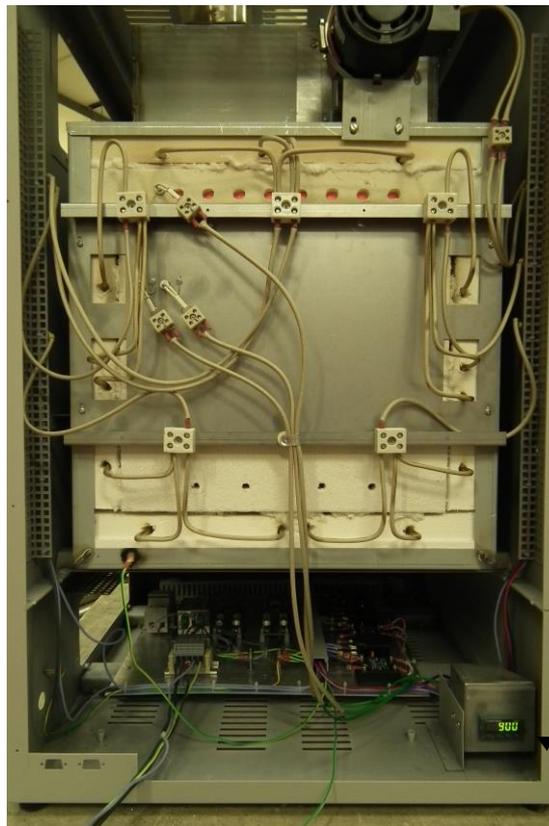
Do not open the furnace door during an ashing procedure as combustion will be taking place within the chamber.

### 3.2 Temperature Control

Main controller Eurotherm 3216 P1 max temp 800°C. See separate manual.

Afterburner controller Eurotherm 2132 max temp 950°C. See separate manual.

Element over-temperature controller 2132. This 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 to hot, and then switches back on. The element over-temperature controller is fitted as additional protecting for the heating elements. This over-temperature is self resetting and should not need any user adjustment. It is access by removing the back panel – see photo 3.5 below:



Element over  
temperature  
controller

Photo 3.5

## MAINTENANCE & REPAIRS

### 4.0 Safety Note - Refractory Fibrous Insulation



#### **Insulation made from High Temperature Insulation Wool**

#### **Refractory Ceramic Fibre, (better described as Alumino 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, mineral wool slab or loose fill wool.

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 fibrous dust may cause respiratory disease.**

**When handling the material always use an approved respiratory protection equipment (RPE-i.e. 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 we recommend reference to the European Association representing the High Temperature Insulation Wool industry ([www.ecfia.eu](http://www.ecfia.eu))

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.

### 4.1 General Maintenance



Regularly clean the plenum chamber, as described below.

The outer surface of the unit 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.

Occasionally remove the lower side panels and clean out any accumulated dust in the balance compartment. If necessary, remove the balance assembly and give a thorough cleaning.

If the ABF is used below its maximum temperature of 800°C, then regularly heat it up to 750°C for one hour, without load, to burn off any accumulated soot.

### 4.2 Cleaning the Plenum Chamber & Fan Impeller



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

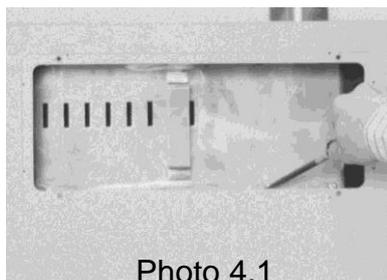


Photo 4.1

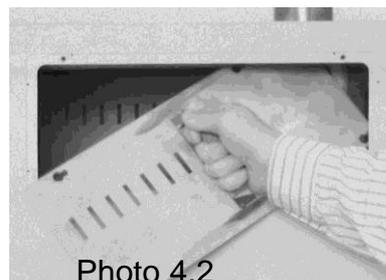


Photo 4.2

accessing the plenum chamber

### **4.3 Temperature Control Calibration**

After prolonged use the controller and/or thermocouple could require recalibration. 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.

#### **After Sales Service**

Carbolite has a team of Service Engineers who repair furnaces both at our factory and at our customers' premises throughout the world. We also sell spares by mail order. A telephone call or fax to our Service Department often enables a fault to be diagnosed and the necessary spare part despatched.

Each unit made has its own record card at Carbolite. In all correspondence please quote the model type (ABF 8/28) and serial number as given on the rating label. The serial number and model type are also given on the front of this booklet when supplied together with a new unit.

### **4.4 Recommended Spares**

Carbolite can supply individual spares, or a kit of the items most likely to be required. Please consult Carbolite Sales Department for details of recommended spares.

### **4.5 Solid-state Relay Replacement**

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

Make a note of the wire connections to the solid state relay, and disconnect them.

Remove the solid state relay from the aluminium plate.

Replace and reconnect the solid state relay ensuring that a thin layer of white, heat-conducting silicon paste (as supplied) is applied between the new relay and the base panel.

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.

### **4.6 Thermocouple Replacement**

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

Make a note of the thermocouple connections. The negative leg of the thermocouple is marked blue. Compensating cable colour codings are *negative*: white, *positive (type K)*: green

Disconnect the thermocouple from its terminal block.

Unscrew the screw and wire fixing 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 screw fixing is used to grip the sheath.

### **4.7 Element Replacement**

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

### **4.8 Door Plug Replacement**

Contact Carbolite Service Department should this require maintenance.

## 5.0 FAULT FINDING



Disconnect the equipment from the supply before carrying out any internal investigation.

<b><u>Furnace Does Not Heat Up</u></b>			
The Heat lamp is On	→	The heating element has failed	→ Check also that the SSR is working correctly
The Heat lamp is Off	→	The controller shows a very high temperature or a code such as S.br	→ The thermocouple may have broken or may have a wiring fault
	→	The controller shows a low temperature	→ The door switch may be faulty
			→ A relay 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 lamps glowing on the controller	→ Check the supply fuses and any fuses in the control compartment
			→ The controller may be faulty or not receiving a supply due to a faulty switch or a wiring fault
<b><u>Furnace Slow To Heat Up</u></b>			
One of the Heat lamps does not light	→	A fuse may have blown	→ Check the Supply fuses
The Heat lamps all light up	→	An element may have failed	
<b><u>Furnace Overheats</u></b>			
The Heat lamp goes Off with the instrument switch	→	The controller shows a very high temperature	→ The controller may be 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
The Heat lamp 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
<b><u>Chimney Emits Smoke</u></b>			
Some light smoke is emitted in the middle of the test	→	No fault	
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
	→	A fuse may have blown	→ Check the Supply fuses

## 6.0 CIRCUIT DIAGRAMS & FUSES

See wiring diagram 00348-1-5003

### Fuses

The following fuse types are present:

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

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

## 6.1 Customer Supply Fusing

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

The supply fuse rating should be as follows:

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

## 6.2 Power Limit Values

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

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

## 7 SPECIFICATIONS

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

### 7.1 Model Covered by this Manual

Carbolite 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	120kg (approximate)
Power Rating	8000 Watts
Max Temperature	800°C

### 7.2 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.

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*For preventive maintenance, repair and calibration of all Furnace and Oven products, please contact:*

**Carbolite Engineering Services**

**Telephone:** +44 (0)1433 624242

**Fax:** +44 (0)1433 624243

**Email:** [service@carbolite.com](mailto:service@carbolite.com)

**CARBOLITE**<sup>®</sup>  
ENGINEERING SERVICES

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**CARBOLITE**<sup>®</sup>

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

**Telephone:** +44 (0)1433 620011

**Fax:** +44 (0)1433 621198

**E-mail:** [info@carbolite.com](mailto:info@carbolite.com)