Release R.1.3 UK

BFC

28
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Installation User and Service Manual

A.O.SMITH

WATER PRODUCTS COMPANY

A DIVISION OF A. O. SMITH CORPORATION

CYCLONE

XTRA HIGH EFFICIENCY

CE

www.aosmithinternational.com

your installer

Warning
Read this manual carefully before first using the water heater. Failure to read this manual and to follow the instructions in this manual may lead to accidents, personal injury, and damage to the appliance.

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Although considerable care has been taken to ensure a correct and suitably comprehensive description of all relevant components, the manual may nonetheless contain errors and inaccuracies.

Should you detect any errors or inaccuracies in the manual, we would be grateful to receive notification. This helps us to further improve our documentation.

More information

If you have any comments or queries concerning any aspect related to the appliance, then please do not hesitate to contact A.O. Smith Water Products Company.

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In the event of problems with connecting to the gas, electricity or water supply, please contact your installation's supplier/installer.

Table of contents

1 Introduction

1.1 About the appliance

This manual describes how to install, service and use the BFC appliance. The BFC appliance is a condensing room-sealed water heater with a fan in the air intake. A concentric chimney connector is fitted standard to the appliance. Alternatively, the appliance can be connected using a parallel system. Installation types possible with this appliance are C13, C33, C43, C53 and C63. The information in this manual is applicable to types: BFC 28, BFC 30, BFC 50 and BFC 60.

The manner of construction and features of the appliance are in conformance with the European standard for gas-fired storage water heaters for the production of domestic hot water (ES 89). The appliances are therefore compliant with the European Directive for Gas Appliances, and have the right to bear the CE mark.

CE
0063

Warning
Read this manual carefully before starting up the water heater. Failure to read the manual and to follow the printed instructions may lead to personal injury and damage to the appliance.

1.2 What to do if you smell gas

Warning
Whenever there is a **smell of gas**:

No naked flames! No smoking!

Avoid causing sparks! Do not use any electrical equipment or switch, i.e. no telephones, plugs or bells!

Shut off the mains gas supply!

Open windows and doors!

Warn occupants and leave the building!

After leaving the building, alert the gas distribution company or installer.

1.3 Regulations

As the (end) user, installer or service and maintenance engineer, you must ensure that the entire installation complies, as a minimum, with the official local:

- building regulations;
- energy supplier’s directives for existing gas installations;
- directives and technical guidelines for natural gas installations;
- safety requirements for low-voltage installations;
- regulations governing the supply of drinking water;
- regulations governing ventilation in buildings;
- regulations governing the supply of air for combustion;
- regulations governing the discharge of products of combustion;
- requirements for installations that consume gas;
- regulations governing indoor waste water disposal;
- regulations imposed by fire service, power companies and municipality;

Furthermore, the installation must comply with the manufacturer's instructions.

Remark
Later amendments and/or additions to all regulations, requirements and guidelines published on or prior to the moment of installing, will apply to the installation.

1.4 Target groups

The three target groups for this manual are:

- (end) users;
- installers;
- service and maintenance engineers.

Symbols on each page indicate the target groups for whom the information is intended. See Table 1.1.

Table 1.1 Target group symbols

Symbol	Target group
	(End) user
	installer
	Service and maintenance engineer

1.5 Maintenance

A service should be carried out at least once a year, both on the water side and on the gas side. Maintenance frequency depends, among other things, on the water quality, the average burning time per day and the set water temperature.

Remark
To determine the correct maintenance frequency, it is recommended to arrange for the service and maintenance engineer to check the appliance on both the water and gas side, three months after installation. Based on this check, the best maintenance frequency can be determined.

Remark
Regular maintenance extends the service life of the appliance.

1.6 Forms of notation

The following notation is used in this manual:

Remark
Important information

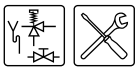
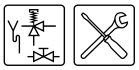
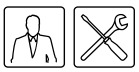
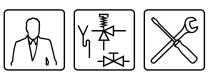
Note
Ignoring this information can lead to the appliance being damaged.

Warning
Failure to carefully read this information may lead to danger of personal injury, and serious damage to the appliance.

1.7 Overview of this document

Table 1.2 provides an overview of the contents of this document.

Table 1.2 Contents of document

Chapter	Target groups	Description
2 Functioning of the appliance		This chapter describes how the appliance functions.
3 Installation		This chapter describes the installation activity to be completed before you actually start up the appliance.
4 Filling and draining		This chapter describes how to fill and drain the appliance.
5 The control panel		This chapter describes the general control of the appliance using the display.
6 Status of the appliance		This chapter describes the status (mode or condition) that the appliance may have, and possible actions to take.
7 Starting up and shutting down		This chapter describes how to start up the appliance, and how to shut it down for a brief or long period of time. The general heating cycle of the appliance is also described.
8 Main menu		Describes the main menu of the display. This is the actual menu for the user, however the installer and service and maintenance engineers will also need to use this menu.
9 Service program		Describes the service menu. It is mainly intended for the installer and service and maintenance engineers. End users may also refer to this chapter for additional information about the appliance.
10 Troubleshooting		This chapter is mainly intended for the installer and the service and maintenance engineer. It describes appliance errors. These errors are indicated on the display. A troubleshooting table of possible causes and solutions is provided. End users may also refer to this chapter for additional information about the appliance.
11 Maintenance frequency		This chapter describes how to determine the optimum frequency at which to carry out maintenance. Both the end user and the service and maintenance engineer are responsible for regular maintenance. They need to reach clear agreement on this. **Remark** If the appliance is not regularly maintained, the warranty will become void.
12 Maintenance		This chapter sets out the maintenance tasks to be carried out during a service.
13 Warranty (Certificate)		This chapter states the warranty terms and conditions.

2 Functioning of the appliance

2.1 Introduction

Topics covered in this chapter:

- Functional description of the appliance;
- The appliance's heating cycle;
- Protection for the appliance;
- Safety of the installation.

2.2 Functional description of the appliance

Figure 2.1 shows a cut-away view of the appliance.

Legend

❶ plastic top cover
❷ hot water outlet
❸ electrical connection block
❹ ThermoControl
❺ pressure switch
❻ control panel
❼ temperature sensor T_1
❽ combustion chamber
❾ anode
❿ tank
⓫ heat exchanger
⓬ inspection and cleaning opening
⓭ temperature sensor T_2
⓮ cold water inlet
⓯ drain valve
⓰ gas control
⓱ burner
⓲ fan
⓳ air supply hose
⓴ glow igniter
㉑ ionisation rod
㉒ chimney pipe
㉓ siphon
㉔ PU insulation layer

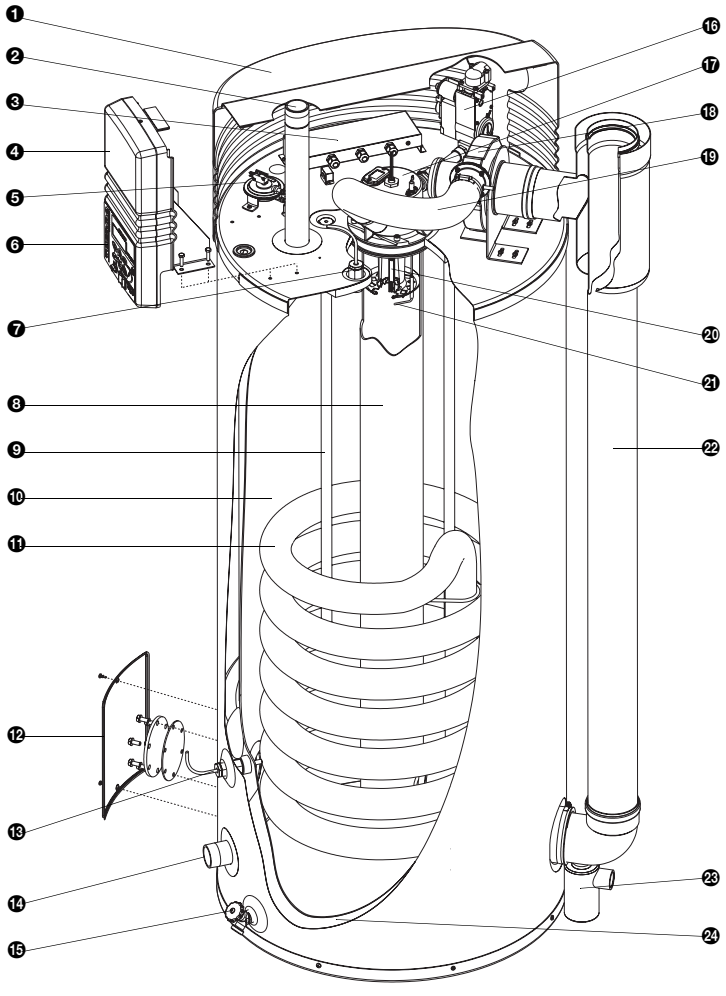


Figure 2.1 Cut-away view of the appliance

In this appliance the cold water enters the bottom of the tank via the cold water inlet ⓮. The tap water, heated by the combustion chamber ❽ and heat exchanger ⓫, leaves the tank through the hot water outlet ❷. Once the appliance is completely filled with water, it remains constantly under water supply pressure. As hot water is drawn from the appliance, cold water is immediately added.

The air required for combustion is forcibly delivered to the burner ⓱ by the fan ⓲. The gas is fed to the burner ⓱ via the gas control ⓰. Thanks to the modulated supply of gas and air, the optimum gas/air mixture is always achieved. The special construction of the burner causes the mixture to form a vortex (the cyclone effect), before it becomes ignited. Because of this vorticity, ignition at the glow igniter ⓴ is improved, and the combustion efficiency is also optimised. Through the special design of the heat exchanger ⓫, the flue gases are first led downwards via the combustion chamber, then upwards again via the heat exchanger, then once more downwards beside the water in the tank. In this process, the flue gases gradually become cooler. Because the cooled flue gases flow alongside the cold water below in the tank, they start to condense. This condensation causes latent heat energy to be released, which is transferred to the cooler water, and thereby increases the performance of the unit. The water of condensation yielded by this process is discharged via the siphon ㉓.

The PU insulation layer ㉔ prevents heat loss. The inside of the tank is enamelled to protect against corrosion. The magnesium anodes ❾ provide extra protection against corrosion.

For use during maintenance, the appliance has a inspection and cleaning opening ⓬.

2.3 The appliance's heating cycle

The entire appliance is controlled (and monitored) by theThermoControl ❹. The temperature sensor T1 ❼ (in the top of the tank ⓾) and the temperature sensor T2 ⓭ (in the bottom of the tank) measure the water temperature. These temperatures are sent to the ThermoControl. Based on these two observations, the ThermoControl calculates a net water temperature: T_{net}. The value of T_{net} lies between the temperatures measured at the top and bottom of the tank. As soon as T_{net} falls below the set water temperature (T_{set}), the ThermoControl registers a 'heat demand'. The gas control ⓰ is opened, and the gas is mixed with air. This mixture is ignited by the glow igniter ⓴ and the water becomes heated. As soon as T_{net} rises above T_{set}, the heat demand ends, and the ThermoControl stops the heating cycle.

Both when registering and ending the heat demand, the ThermoControl assumes a certain margin. We refer to this margin as the hysteresis (see paragraph '9.2 Setting the hysteresis').

2.4 Protection for the appliance

The ThermoControl monitors the water temperature and ensures safe combustion. This is achieved by:

- the Water temperature protection;
- the Gas control;
- the Fan;
- the Pressure switch;
- the Ionisation rod.

2.4.1 Water temperature protection

With temperature sensor T1 ❼ and temperature sensor T2 ⓭, the ThermoControl monitors three temperatures which are important for safety. Table 2.1 explains the functioning of the temperature sensors.

Table 2.1 Temperature protection

Protection	Description
Against frost (T_1 < 5°C or T_2 < 5°C)	The frost protection cuts in. The water is heated to 20°C.
For maximum water temperature (T_1 > 85°C or T_2 > 85°C)	The high-limit safeguard serves to prevent overheating and/or excessive formation of scale in the appliance. Should the high-limit safeguard be activated, the heating is halted. This causes the water in the tank to cool down. Once the water has cooled sufficiently ($T_1 \leq$ 78 °C), the ThermoControl resets the appliance.
For extra safety (T_1 > 93°C or T_2 > 93°C)	A lockout error of the water heater controller takes place. The controller must be manually reset before the appliance can resume operation (see paragraph '6.3 Error conditions'). The reset may only be performed once T_1 < 78°C.

2.4.2 Gas control

The ThermoControl opens the gas control so that gas can be supplied to the burner. As a safety measure, the gas control has two valves. Both valves shut off the gas supply.

Smooth ignition is achieved by opening the gas control with a delay ('softlite').

2.4.3 Fan

The fan provides an optimum air supply when there is a heat demand. A safety aspect is that the fan ensures that any gases present in the combustion chamber get removed, both before and after combustion. We refer to this as pre- and post-purge.

The fan speed is continuously monitored by the ThermoControl. The ThermoControl takes control if the speed of rotation varies too much from the value set.

2.4.4 Pressure switch

The pressure switch ensures the discharge of flue gases and the supply of incoming air during the pre-purge and normal running of the appliance. The standard position of the pressure switch is open. When sufficient pressure differential is reached, the pressure switch closes. However, in the event of a fault, the pressure switch will be tripped open, and the heating cycle will be interrupted.

Table 2.2 shows the trip point per appliance.

Table 2.2 Pressure switch trip points

Appliance	Pressure differential [Pa]	
	Closing	Opening
BFC 28	≥ 635	≤ 605
BFC 30	≥ 855	≤ 825
BFC 50	≥ 885	≤ 855
BFC 60	≥ 1085	≤ 1055

Remark
The trip point of the pressure switch is not adjustable.

2.4.5 Ionisation rod

To ensure that no gas will flow when there is no combustion, an ionisation rod has been fitted. The ThermoControl uses this rod for flame detection, by means of ionisation detection. The ThermoControl cuts in, the instant it detects that there is a gas flow but no flame.

2.5 Safety of the installation

In addition to the appliance's standard safety monitoring, the appliance must also be protected by an expansion vessel, pressure overflow valve, non-return valve and a T&P valve.

Use of an expansion vessel, a pressure relief valve and/or a pressure reducing valve depends on the type of installation: unvented or vented.

2.5.1 Unvented installation

With an unvented installation, a pressure relief valve and expansion vessel prevent excessive pressure in the tank. This prevents damage being caused to the enamelled coating (in the appliance) or to the tank. A non-return valve prevents excessive pressure in the water supply system. This valve also prevents water from flowing backwards from the tank into the cold water supply system. The pressure reducing valve protects the installation against an excessively high water supply pressure (> 8 bar). These components are fitted to the cold water pipe. See paragraph '3.6.1 Cold water side'.

2.5.2 Vented installation

With a vented installation, excess pressure is taken up by the open water reservoir. The level of the water reservoir determines the maximum working pressure in the tank, which may not exceed 8 bar. The installation must also be fitted with an overflow from the hot water pipe, which discharges into the water reservoir. See paragraph '3.6.2 Hot water side'.

2.5.3 T&P valve

A T&P valve is only mandatory in an 'unvented' installation. However, A.O. Smith also recommends the use of a T&P valve in 'vented' installations.

A T&P valve monitors the pressure in the tank, and the water temperature at the top of the tank. If the pressure in the tank becomes excessive (>10 bar) or the water temperature is too high (>97°C), the valve will open. The hot water will immediately flow out of the tank. Because the appliance is under water supply pressure, cold water will automatically flow into the tank. The valve remains open until the unsafe situation has been averted. A connecting point for a T&P valve is standard on the appliance. See paragraph '3.6.2 Hot water side'.

3 Installation

Warning
The installation should be carried out by an approved installer in compliance with the general and local regulations imposed by the gas, water and power supply companies and the fire service.

The appliance may only be installed in a room which complies with the requirements stated in national and local ventilation regulations.

Refer also to paragraph '1.3 Regulations'.

3.1 Introduction

This chapter describes the installation activities to be carried out before the appliance may be started up, namely:

- Packaging;
- Environmental conditions;
- Technical specifications;
- Water connections, Unvented;
- Water connections, Vented;
- Gas connection;
- Air supply and flue gas discharge;
- Electrical connection;
- Checking the supply pressure and burner pressure;
- Conversion to a different gas category.

Remark
Starting up the appliance is described in chapter '7 Starting up and shutting down'.

3.2 Packaging

To avoid damaging the appliance, remove the packaging carefully. We recommend unpacking the appliance at or near its intended location.

Note
The appliance may only be manoeuvred in an upright position. Take care that the appliance is not damaged after unpacking.

3.3 Environmental conditions

The BFC appliance is a room-sealed appliance. Installation types possible with this appliance are C13, C33, C43, C53 and C63. This makes it possible to install the appliance in either a closed or an open boiler room.

3.3.1 Humidity and ambient temperature

The boiler room must be frost-free, or be protected against frost. Table 3.1 shows the environmental conditions that must be adhered to, for correct functioning of the electronics present in the appliance to be guaranteed.

Table 3.1 Humidity and ambient temperature specifications

Humidity and ambient temperature	
Humidity	max. 93% RH at +25°C
Ambient temperature	Functional: $0 \leq t \leq 60$°C

3.3.2 Maximum floor loading

In connection with the appliance's weight, take account of the maximum floor loading, see Table 3.2.

Table 3.2 Weight specifications related to maximum floor loading

Weight of the appliance filled with water	
BFC 28	392 kg
BFC 30, BFC 50, BFC 60	593 kg

3.3.3 Water composition

The appliance is intended for heating drinking water. The drinking water must comply with the regulations governing drinking water for human consumption. Table 3.3 shows these requirements.

Table 3.3 Water specifications

Water composition	
Hardness (alkaline earth ions)	> 1.00 mmol/l: • German hardness >5.6° dH • French hardness > 10.0° fH • British hardness > 7.0° eH
Conductivity	> 125 µS/cm
Acidity (pH value)	7.0 < pH value < 9.5

Remark
If the water specifications deviate from those stated in Table 3.3, then the tank protection cannot be guaranteed.
See also chapter '13 Warranty (Certificate)'.

3.3.4 Working clearances

For access to the appliance it is recommended that the following clearances are observed (see Figure 3.2):

- AA: around the appliance's control column and cleaning openings: 100 cm.
- BB: around the appliance itself: 50 cm.
- Above the appliance (room to replace the anodes):
  - 100 cm if using fixed anodes, or
  - 50 cm if using flexible anodes.

If the available clearance is less than 100 cm, flexible magnesium anodes may be ordered from A.O. Smith, the installer / supplier.

Remark

When installing the appliance, be aware that any leakage from the tank and/ or connections can cause damage to the immediate environment or floors below the level of the boiler room. If this is the case, then the appliance should be installed above a wastewater drain or in a suitable metal leak tray. The leak tray must have an appropriate wastewater drain and must be at least 5cm deep with a length and width at least 5cm greater than the diameter of the appliance.

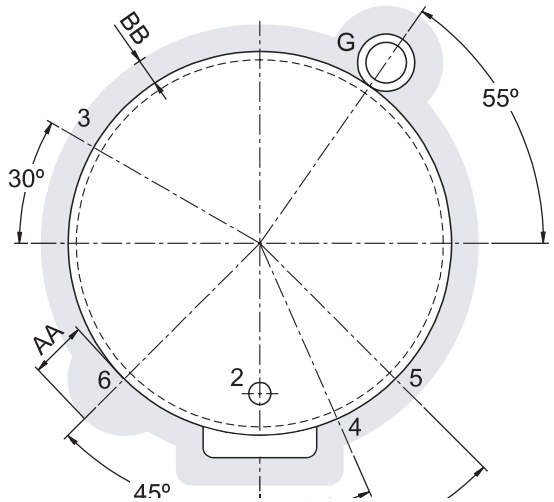


Figure 3.1 Working clearances

3.4 Technical specifications

The appliance is supplied without accessories. Check the dimensions and other specifications for the accessories to be used, based on Figure 3.2 and Table 3.6.

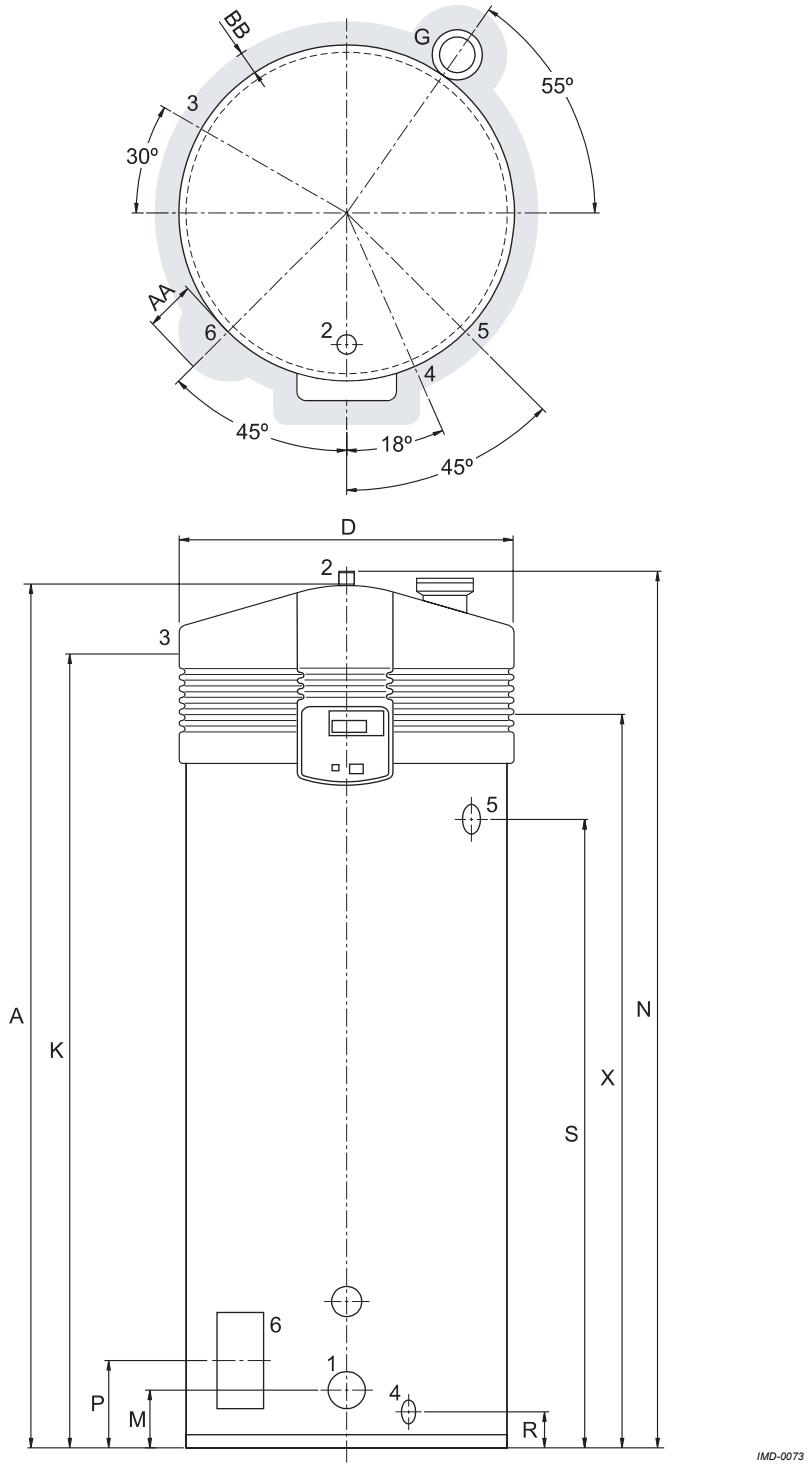


Figure 3.2 Plan and elevation of the appliance

Table 3.4 Dimensions

Dimension	Description	BFC 28	BFC 30	BFC 50	BFC 60
A	Total height (mm)	1370	1900	1900	1900
D	Diameter of the appliance (mm)	705	705	705	705
G	Diameter of air supply/flue gas discharge (mm)	80/125	100/150	100/150	100/150
K	Height of the gas connection (mm)	1270	1810	1810	1810
M	Height of cold water supply connection (mm)	160	160	160	160
N	Height of hot water outlet connection (mm)	1405	1920	1920	1920
P	Height of cleaning and inspection opening (mm)	200	200	200	200
R	Height of drain valve (mm)	75	75	75	75
S	Height of T&P valve (mm)	890	1415	1415	1415
W	Height of condensation drainage (mm)	110	110	110	110
X	Height of air supply connection (mm)	1205	1730	1730	1730
1	Cold water supply connection	R 1½ (external)			
2	Hot water outlet connection	R 1½ (external)			
3	Gas control connection	Rp ¾ (internal)			
4	Drain valve connection (external)	¾"			
5	T&P valve connection (internal)	¾" NPT	1 - 11.5 NPT		
6	Dimensions cleaning and inspection opening (mm)	95 x 70			
7	Condensation drainage connection (internal)	Ø 40 mm	Rp 1	Rp 1	Rp 1

Table 3.5 General and electrical data

DESCRIPTION	Unit	BFC 28	BFC 30	BFC 50	BFC 60
Capacity	litres	217	368	368	368
Maximum working pressure	bar	8	8	8	8
Empty weight	kg	175	225	225	225
Heating time $\Delta T = 45^{o}C$	minutes	23	35	24	20
Number of anodes	-	4	4	4	4
Number of bar burners/orifices	-	n.a.	n.a.	n.a.	n.a.
Number of flue tubes/flue baffles	-	1/?	1/?	1/?	1/?
Fan rotational speed at ignition	r. p.m.	4500	4500	4500	4500
Working speed of fan	rpm	4980	5400	6000	6660
Diameter of air restrictor	mm	23.0	23.0	28.0	29.0

Table 3.5 General and electrical data

DESCRIPTION	Unit	BFC 28	BFC 30	BFC 50	BFC 60
Electrical power consumption	W	175			
Supply voltage	VAC	230 (-15% +10%)			
Mains frequency	Hz	50 (±1 Hz)			

Table 3.6 Gas data

Gas category data II_{2H3+}	Unit	BFC 28	BFC 30	BFC 50	BFC 60
Data for natural gas 2H: G20-20 mbar					
Orifice diameter	mm	4.90	5.10	7.00	7.10
Nominal load (upper value)	kW	32.1	34.5	52.6	63.2
Nominal capacity	kW	30.3	32.8	48.6	59.6
Supply pressure	mbar	20	20	20	20
Burner pressure	mbar	8.5	8.5	8.5	11.5
Gas consumption(1)	m^3/h	3.1	3.3	5.0	6.0
Data for LP gas 3+					
General					
Orifice diameter	mm	2.50	2.60	3.40	3.80
Restrictor diameter	mm	n.a.	n.a.	n.a.	n.a.
G30-30 mbar (butane)					
Nominal load (upper value)	kW	30.7	32.8	50.6	59.4
Supply pressure	mbar	37	37	37	37
Burner pressure(2)	mbar	37	37	37	37
Gas consumption(1)	kg/h	2.2	2.4	3.7	4.3
G31-37 mbar (butane)					
Nominal load (upper value)	kW	29.0	30.9	50.3	59.1
Supply pressure	mbar	37	37	37	37
Burner pressure(2)	mbar	37	37	37	37
Gas consumption(1)	kg/h	2.1	2.2	3.6	4.2

(1) Based on 1013.25 mbar and 15°C.
(2) If using a flat sealing plate instead of a burner pressure regulator, it is assumed that the burner pressure is equal to the supply pressure. In practice however, the burner pressure will be lower.

3.5 Installation diagram

Figure 3.3 shows the water and gas connection diagrams for unvented and vented installations. The following paragraphs, describing the connections in detail, make reference to these diagrams

Legend

- ❶ pressure-reducing valve (mandatory)
- ❷ expansion vessel (mandatory)
- ❸ T&P valve (mandatory)
- ❹ stop valve (recommended)
- ❺ non-return valve (mandatory)
- ❻ circulation pump (optional)
- ❼ drain valve
- ❽ gas valve (mandatory)
- ❾ stop valve (mandatory)
- ❿ temperature gauge (optional)
- ⓫ condensation drainage (mandatory)
- ⓬ hot water draw-off points
- ⓭ pressure relief valve (mandatory)
- ⓮ water cistern
- ⓯ float valve
- ⓰ 3-way venting valve (recommended)
- ⓱ overflow pipe
- Ⓐ cold water supply
- Ⓑ hot water outlet
- Ⓒ circulation pipe
- Ⓓ gas supply
- Ⓔ flue gas discharge and air supply

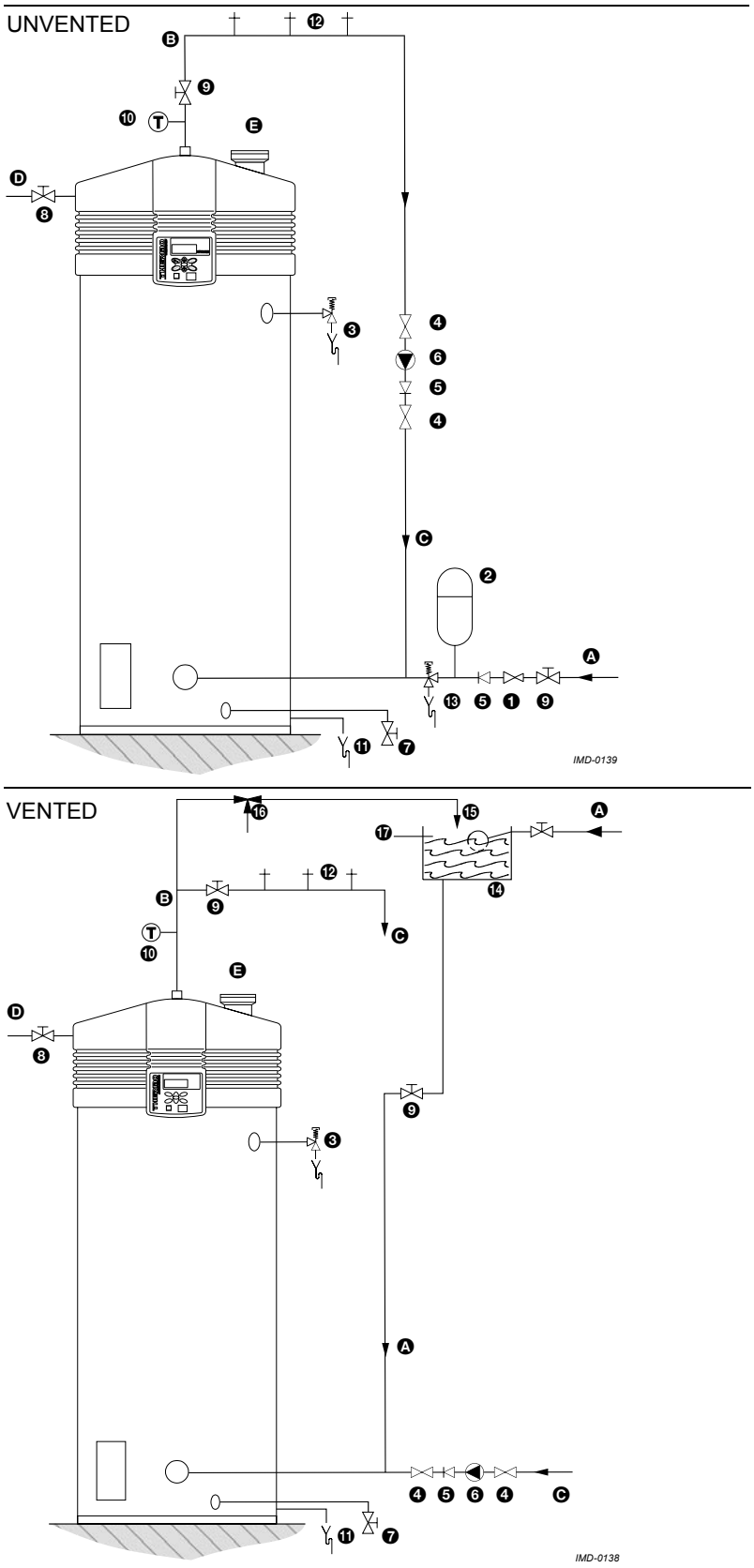


Figure 3.3 Installation diagrams

3.6 Water connections, Unvented

3.6.1 Cold water side

See Ⓐ in Figure 3.3.

1. Fit an approved stop valve ❾ on the cold water side as required by regulations.
   Refer also to paragraph '1.3 Regulations'.
2. The maximum working pressure of the appliance is 8 bar. Because the pressure in the water pipe at times can exceed 8 bar, you must fit an approved pressure-reducing valve ❶.
3. Fit a non-return valve ❺ and an expansion vessel ❷.
4. Fit a pressure relief valve ⓲ and connect the overflow side to an open wastewater pipe.

3.6.2 Hot water side

See Ⓑ in Figure 3.3.

Remark
Insulating long hot water pipes prevents unnecessary energy loss.

1. Optional: fit a temperature gauge ❿ to be able to check the temperature of the tap water.
2. Fit the T&P valve ❸.
3. Fit a stop valve ❾ in the hot water outlet pipe, for use when servicing.

3.6.3 Circulation pipe

See Ⓒ in Figure 3.3.

If an immediate flow of hot water is required at draw-off points, a circulation pump can be installed. This improves comfort and reduces water wastage.

1. Fit a circulation pump ❻ of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve❺ behind the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves ❹ for service purposes.
4. Connect the circulation pipe to the cold water supply pipe.

3.6.4 Condensation drainage

1. Fit a sloping wastewater pipe to the siphon ⓫ for condensation drainage and connect this to the wastewater discharge in the boiler room.

Note
All piping behind the siphon must be condensation-resistant.

3.7 Water connections, Vented

3.7.1 Cold water side

See Ⓐ in Figure 3.3.

1. Fit an approved stop valve ❾ on the cold water side between the water cistern ⓮ and the appliance, as required by regulations. Refer also to paragraph '1.3 Regulations'.

3.7.2 Hot water side

See Ⓑ in Figure 3.3.

Remark
Insulating long hot water pipes prevents unnecessary energy loss.

1. Fit the T&P valve ❸.
2. Optional: fit a temperature gauge ❿ to be able to check the temperature of the tap water.
3. Fit a stop valve ❾ in the hot water outlet pipe, for use when servicing.
4. If a circulation pipe is to be fitted, then refer to paragraph 3.7.3.

3.7.3 Circulation pipe

See Ⓒ in Figure 3.3.

If an immediate flow of hot water is required at draw-off points, a circulation pump can be installed. This improves comfort and reduces water wastage.

1. Fit a circulation pump ❻ of the correct capacity for the length and resistance of the circulation system.
2. Fit a non-return valve❺ behind the circulation pump to guarantee the direction of circulation.
3. Fit two stop valves ❹ for service purposes.
4. Connect the circulation pipe to the cold water supply pipe.

3.7.4 Condensation drainage

See paragraph '3.6.4 Condensation drainage'.

3.8 Gas connection

Warning
Gas installation may only be carried out by an authorised installer in compliance with the general regulations imposed by the gas company. Refer also to paragraph '1.3 Regulations'.

Note
Make sure that the diameter and length of the gas supply pipe are large enough to supply sufficient capacity to the appliance.

See Ⓓ in Figure 3.3.

1. Fit a gas valve ❽ in the gas supply pipe.
2. Blow the gas pipe through before use, to be sure it is clean.
3. Close the gas valve.

4. Fit the gas supply pipe to the gas control.

Warning
Check for leaks after fitting.

3.9 Air supply and flue gas discharge

Warning
The installation should be carried out by an authorised installer, in compliance with the general and local regulations imposed by gas, water supply and power supply companies and the fire service. Refer also to paragraph '1.3 Regulations'.

Depending on the approved installation types, there are several alternatives for connecting the air supply and flue gas discharge. The BFC appliances are approved for installation types C13, C33, C43, C53 and C63.

The most common installation types are:

- C13: Concentric wall flue terminal and
- C33: Concentric roof flue terminal.

This manual describes these installation types. If an explanation of other types of installation is required, please contact A.O. Smith.

Note
A.O. Smith prescribes the use of a roof or wall-mounted terminal, exclusively of a type approved for the appliance. See paragraph '3.9.1 Concentric wall flue terminal' and '3.9.2 Concentric roof flue terminal'. Use of an incorrect roof or wall-mounted terminal can cause the installation to malfunction.

Remark
Make sure that the chimney discharges into an area where this is permitted for this category of appliance.

Table 3.7 shows the maximum length of the chimney configurations. The following requirements must also be fulfilled:

- the maximum chimney length is 15 metres.
- The maximum permitted number of 45° or 90° bends is four.

Table 3.7 Chimney configurations for concentric wall and roof termination.

Dimension (1)	BFC 28	BFC 30	BFC 50	BFC 60
A	0-15 m	0-15 m	0-15 m	0-15 m
B	0-15 m	0-15 m	0-15 m	0-15 m
a + B	max. 15 m	max. 15 m	max. 15 m	max. 15 m

1. *See 'Figure 3.4 Wall flue terminal' and 'Figure 3.5 Roof flue terminal'.*

Note
If you make use of horizontal piping, then this must slope towards the appliance with a minimum of 5 mm per metre running length!

3.9.1 Concentric wall flue terminal

Table 3.8 shows the wall flue terminal prescribed by A.O. Smith (installation type C13).

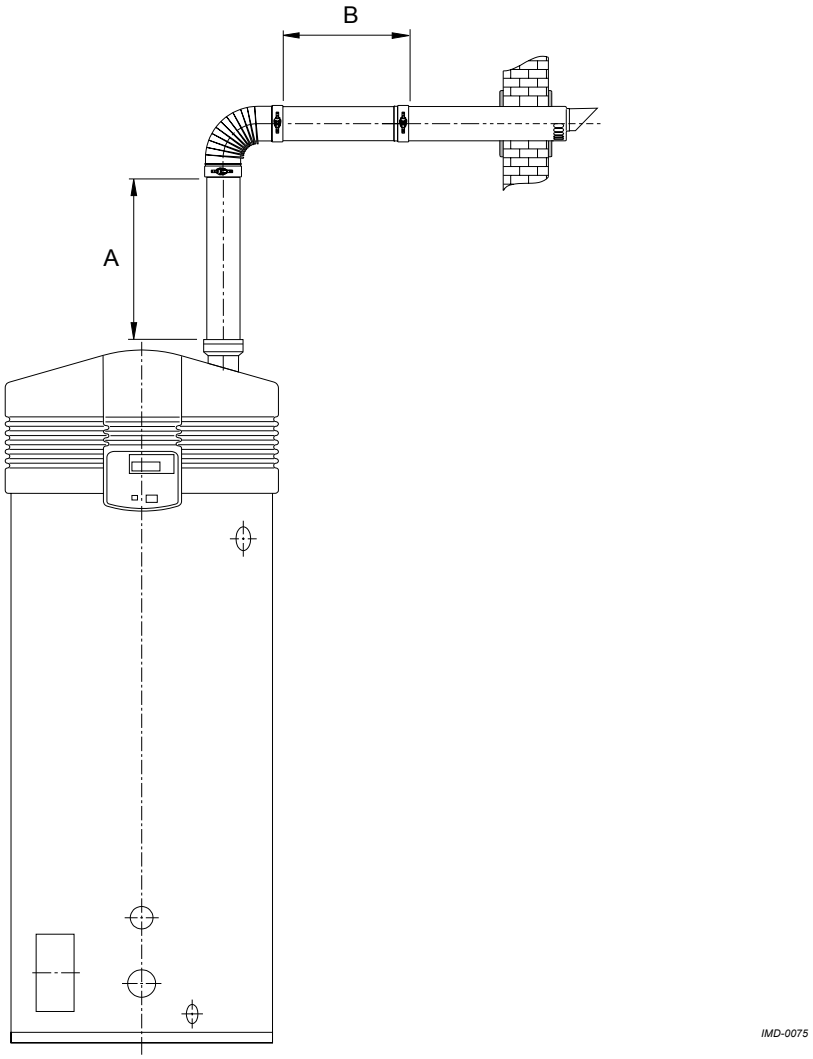


Figure 3.4 Wall flue terminal

Table 3.8 Concentric wall flue terminal specifications

Specification	Description
Manufacturer	Muelink & Grol
Model	M2000 MDV SE(1)
Pipe material, flue gas discharge	Thick-walled aluminium with lip ring seal
Pipe material, air intake	Thin-walled galvanised sheet steel
Pipe diameter	Concentric • BFC 28: Ø 80/125 mm. • BFC 30, 50 and 60: Ø 100/150 mm.

1. *The M2000 MDV SE model is a special version of the **Mugro 3000 series**. No other wall flue terminal may be used, as the BFC-appliance is approved exclusively for this model of wall flue terminal. You can order the wall flue terminal from A.O. Smith or your trade supplier, by specifying model: M2000 MDV SE.*

3.9.2 Concentric roof flue terminal

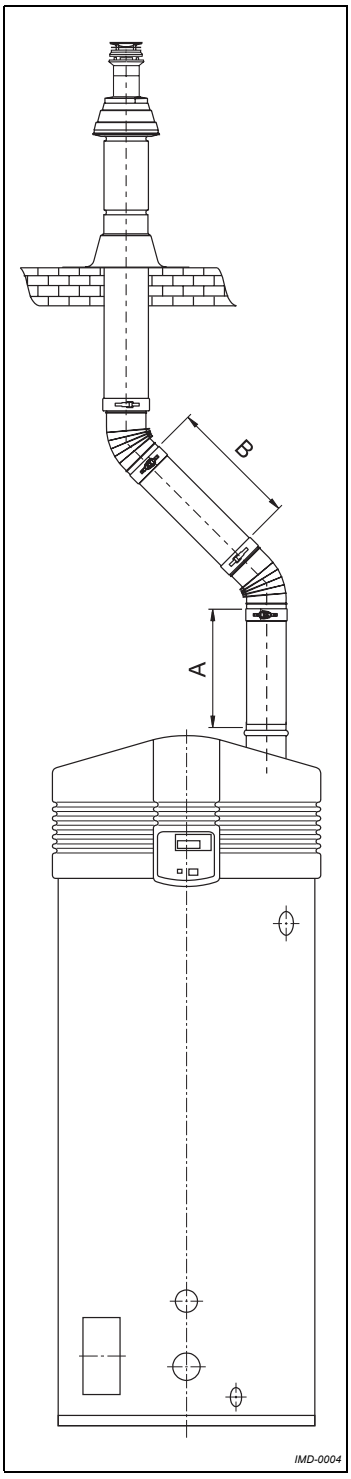


Figure 3.5 Roof flue terminal

A.O. Smith Water Products Company prescribes the roof flue terminal (installation type C33) as specified in Table 3.9.

Table 3.9 Concentric roof flue terminal specifications

Specification	Description
Manufacturer	Muelink & Grol
Model	M2000 DDV SEC HR(1)
Pipe material, flue gas discharge	Thick-walled lip ring seal
Pipe material, air intake	Thin-walled galvanised sheet steel
Pipe diameter	Concentric • BFC 28: 80/125 mm. • BFC 30, 50 and 60: Ø 100/150 mm.

1. *The model M2000 DDV SEC HR is a special version of the **Mugro 3000 series.** No other roof flue terminal may be used, as the BFC- appliance is approved exclusively for this model of roof flue terminal. You can order the roof flue terminal from A.O. Smith or your trade supplier, by specifying model: M2000 DDV SEC HR.*

3.10 Electrical connection

Warning
The installation should be carried out by an approved installer in compliance with the general and local regulations imposed by the gas, water and power supply companies and the fire service.
Refer also to paragraph '1.3 Regulations'.

3.10.1 Introduction

Topics covered in this paragraph:

- 3.10.2 Preparation;
- 3.10.3 Mains voltage;

Optionally, it is possible to connect an isolating transformer, a continuous pump, a program-controlled pump, a "Tank ON" and an "Alarm OFF" to the appliance. For these options, see:

- 3.10.4 Isolating Transformer;
- 3.10.5 Continuous pump;
- 3.10.6 program-controlled pump;
- 3.10.7 Extra ON mode switch ("Tank ON");
- 3.10.8 Connecting extra error signal ("Alarm OUT").

Remark
The optional components are not included in the rating for electrical power consumption (see tables in paragraph 3.4).

3.10.2 Preparation

Note
The appliance is phase-sensitive. It is **absolutely essential** to connect the phase (L) from the mains to the phase of the appliance, and the neutral (N) of the mains to the neutral of the appliance.
There should also be **no potential difference** present between neutral (N) and earth (⏚). If this is the case, then an isolating transformer must be applied in the supply circuit. See '3.10.4 Isolating Transformer'.

Figure 3.6 shows a view of the electrical connection block. Table 3.10 shows the associated connections.

Table 3.10 Electrical connection block

Unused	Tank on		Continuous pump			Regulated pump			Alarm Off			Isolating transformer						Mains power		
												primary			secondary					
	X_1	X_2	⏚	L	N	N	L	⏚	X_1	X_2	⏚	N	L	⏚	N	L	⏚	N	L	⏚
1-4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

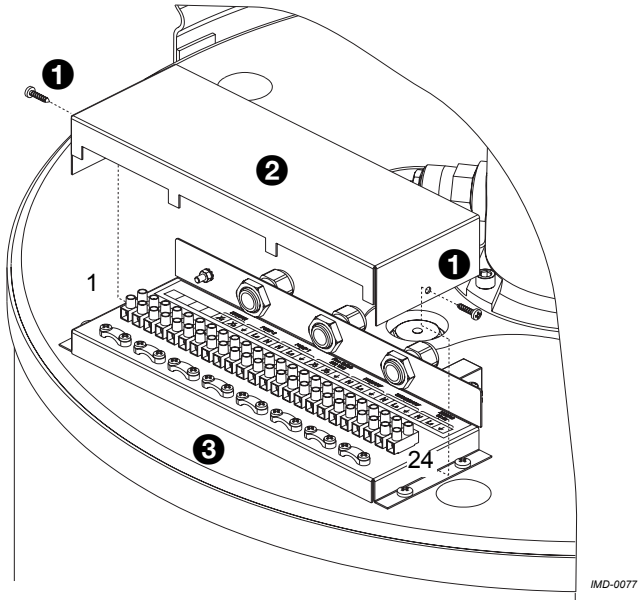


Figure 3.6 Connection block (connections 1 through 24 explained in Table 3.10)

In preparation you should first remove the two plastic covers and the protective cap of the electrical section. The plastic covers are attached to the appliance by 4 screws and Velcro fastenings. The covers are also joined to each other with Velcro fastenings.

1. Unscrew the screws of the plastic covers.
2. Carefully remove the black plastic covers from the appliance.
   The electrical section is now visible.
3. Undo the 2 screws ❶ from the electrical section and remove the protective cap ❷ from the electrical section.
   The connection block ❸ is now visible.

Remark
Refer to 'A.2 Electrical diagram BFC' for the connection of electrical components.

3.10.3 Mains voltage

The appliance is supplied without a power cord and main switch.

Remark
In order to receive electrical power, the appliance has to be connected to the mains voltage by means of a permanent electrical connection. A two-terminal main switch with a contact gap of at least 3 mm must be fitted between this fixed connection and the appliance. The power cord must have cores of at least 3 x 1.0 mm^2.

1. Connect phase (L), neutral (N) and earth (⏚) of the power cord to terminals 22 through 24 of the connector block as indicated in Table 3.10.
2. Fit the power cord in the pull relief.
3. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.

4. Connect the power cord to the main switch.

Warning
Leave the appliance disconnected until you are ready to start it up.

5. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.

3.10.4 Isolating Transformer

An isolating transformer should be used if there is a case of “floating neutral”.

1. Refer to fitting instructions provided with the isolating transformer(1).
2. Connect phase (L), neutral (N) and earth (⏚) of the power cables to terminals 16 through 21 of the connector block as indicated in Table 3.10.
3. Fit the cables in the pull relief.
4. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.
5. Connect the power cord to the main switch.

3.10.5 Continuous pump

The continuous pump will start up as soon as mains power is connected to the appliance.

1. Connect phase (L), neutral (N) and earth (⏚) to terminals 7, 8 and 9 as indicated in Table 3.10.
2. Fit the cable in the pull relief.
3. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.

3.10.6 program-controlled pump

Switching on of the program-controlled pump is determined by settings of the ThermoControl.

1. Connect phase (L), neutral (N) and earth (⏚ to terminals 10, 11 and 12 as indicated in Table 3.10.
2. Fit the cable in the pull relief.
3. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.

3.10.7 Extra ON mode switch (“Tank ON”)

Tank ON is a facility for connecting an external ON/OFF switch. In the OFF position, the programmed operating mode is active. In the ON position, the programmed operating mode is overruled, and the “ON mode” is active.

1. Connect cables (X_1 and X_2) to terminals 5 and 6 as indicated in Table 3.10.
2. Fit the cable in the pull relief.

1. *Contact A.O. Smith for details of the correct isolating transformer.*

3. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.

3.10.8 Connecting extra error signal (“Alarm OUT”)

Alarm OUT is a potential free terminal that is switched when an error is detected. This can be used to signal errors, for example by turning on a lamp. A 230 V circuit can be directly powered. For other voltages, a specific relay prescribed by A.O. Smith is required.

1. Connect the phase cables (X_1 and X_2) to terminals 13 and 14 as indicated in Table 3.10. If required, connect earth (⏚) to terminal 15.
2. Fit the cable in the pull relief.
3. If you do not need to make any more connections:
   - Fit the cap on the electrical connection block.
   - Fit the plastic covers onto the appliance.

3.11 Checking the supply pressure and burner pressure

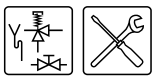
Note
Before you start up the appliance and/or begin to check the supply pressure and burner pressure, you must first fill the appliance. Please refer to paragraph ’4.2 Filling the appliance’ for filling instructions.

Note
Before starting-up for the first time, and following conversion, you must always check the supply pressure and burner pressure. If necessary, adjust these to be certain of optimum performance of the appliance.

Note
The easiest way to check the gas pressures is by using two pressure gauges. This procedure assumes that these two gauges are available.

To check the supply pressure and burner pressure, proceed as follows:

1. Disconnect the appliance from the mains. See paragraph ’7.3.2 Disconnect the appliance from the mains’.
2. Undo the screws of the plastic covers.
3. Carefully remove the black plastic covers from the appliance.
   The electrical section is now visible.
4. There are 2 test nipples on the gas control (Figure 3.13) for measuring the supply pressure ⑫ and the burner pressure ⑱ respectively.
   Sealing screws are located inside the test nipples. Loosen both sealing screws by a few turns. Do not loosen them completely; this makes them difficult to tighten again.
5. Connect a pressure gauge to the lower pressure test nipple ⑱.
6. Open the gas supply and vent the gas supply line via the upper nipple ⑫.
7. Connect a pressure gauge to the upper test nipple as soon as gas starts to flow from this nipple.
8. Switch on the power to the appliance using the mains switch on the appliance.



9. Turn the ThermoControl **ON** by setting the 0/I switch to **position I**.

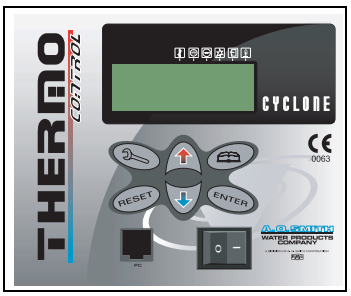


Figure 3.7 ThermoControl

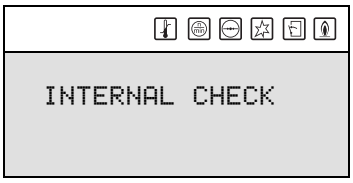


Figure 3.8 Internal check

The display will now show INTERNAL CHECK for about 10 seconds, and will then go to the main menu.

Figure 3.9 Main menu

10. Activate the “ON mode” by going through the following steps:
    - Press once on the blue arrow (↓) to bring the pointer (→) to ON and press **ENTER**. The display as shown in Figure 3.10 appears.
    - Confirm with **ENTER** the option START OPERATION.

    The appliance is now in “ON mode” and will ignite.

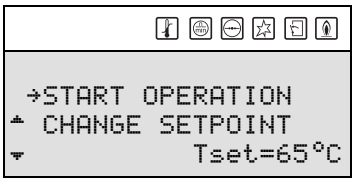


Figure 3.10 Starting up

11. Once the display shows the text RUNNING you must wait about 1 minute before reading the dynamic pressures (the fan needs this time to run up to full rotational speed).
12. Use the pressure gauge to read the supply pressure at the test nipple ⓲. Depending on the gas, refer to Table 3.6.

Remark
Consult the mains gas supply company if the supply pressure is not correct.

Remark
If the burner pressure is not correct and the appliance is fitted with a flat sealing plate, you will not be able to adjust the pressure. In this case, consult your installer or supplier.
If the appliance is fitted with a burner pressure regulator, then the pressure can be adjusted by following steps 13 through 17.

13. Remove the cap ❽ from the burner pressure regulator ❼.
14. Adjust the burner pressure by turning the adjusting screw ❾, depending on the correction required:
    - Adjusting screw anticlockwise: burner pressure decreases.
    - Adjusting screw clockwise: burner pressure increases.
15. Cover the opening of the adjusting screw and check the burner pressure against the target value from Table 3.6.
16. If the pressure reading is not correct, repeat steps 14 and 15 until the correct pressure is attained.

Figure 3.11 Main menu

17. Activate the “OFF mode” of the ThermoControl:
    - If the MENU is not displayed:
      press .
    - Use ↑ and ↓ to position the cursor (→) beside OFF
    - Confirm with **ENTER**.
18. Wait until the fan has stopped. and turn the ThermoControl off.

Note
Failure to wait until the fan stops can cause damage to the appliance.

19. Shut off the gas supply.
20. Disconnect the two pressure gauges and re-tighten the sealing screws in the test nipples.
21. Replace the plastic covers.

Remark
Before starting-up the appliance, take time to fill in the warranty card supplied with the appliance. This enables us to guarantee the quality of our systems, and to further enhance our warranty procedure.

Please return this card as soon as possible. Your customer will then receive a warranty certificate with our warranty conditions.

3.12 Conversion to a different gas category

Note
The conversion may only by carried out by an authorised installer.

If the appliance must operate on a family of gas (LP gas or natural gas) other than the category of gas for which the appliance has been set up at the factory, the appliance will have be adapted using a special conversion kit.

Note
After conversion, check the supply pressure and the burner pressure.

1. Disconnect the appliance from the mains. See paragraph ’7.3.2 Disconnect the appliance from the mains’.
2. Shut off the gas supply.
3. Undo the screws of the plastic covers.
4. Carefully remove the black plastic covers from the appliance.
5. Loosen the 2 screws of the electrical section, and remove the protective cap from the electrical section Figure 3.6).
6. Detach the connector ❶ that connects the cabling of the glow igniter and the ionisation rod to the controller.
7. Detach the three-part gas coupling ❷ adjacent to the burner.
   - Detach the air supply hose ❸.
   - Detach the detach the pressure switch hose ❹.

8. Remove the burner as complete assembly.

Legend
- ❶ connector
- ❷ gas coupling
- ❸ air supply hose
- ❹ pressure switch hose
- ❺ distribution plate
- ❻ orifice

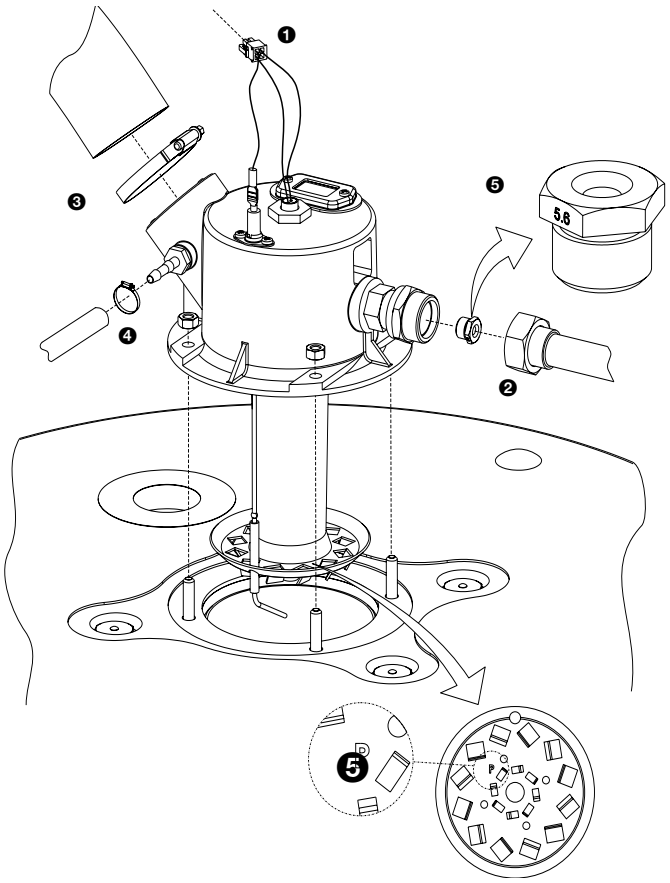


Figure 3.12 Orifice assembly

9. Place and fit the burner with parts from the conversion kit.

Remark
The burner for LP gases can be recognised by the letter 'P' which is stamped into the metal of the gas/air distribution plate ❺.

10. Select and fit the correct orifice from the conversion kit, based on Table 3.6. The injector diameter is stamped into each injector ❻
11. Check whether there is a burner pressure regulator ❼ fitted to the gas control, or simply a flat sealing plate⓫.

Legend
- ❼ *burner pressure regulator*
- ❽ *burner pressure control cap*
- ❾ *burner pressure control adjusting screw*
- ❿ *connector*
- ⓫ *flat sealing plate*
- ⓬ *supply pressure test nipple burner pressure test nipple*

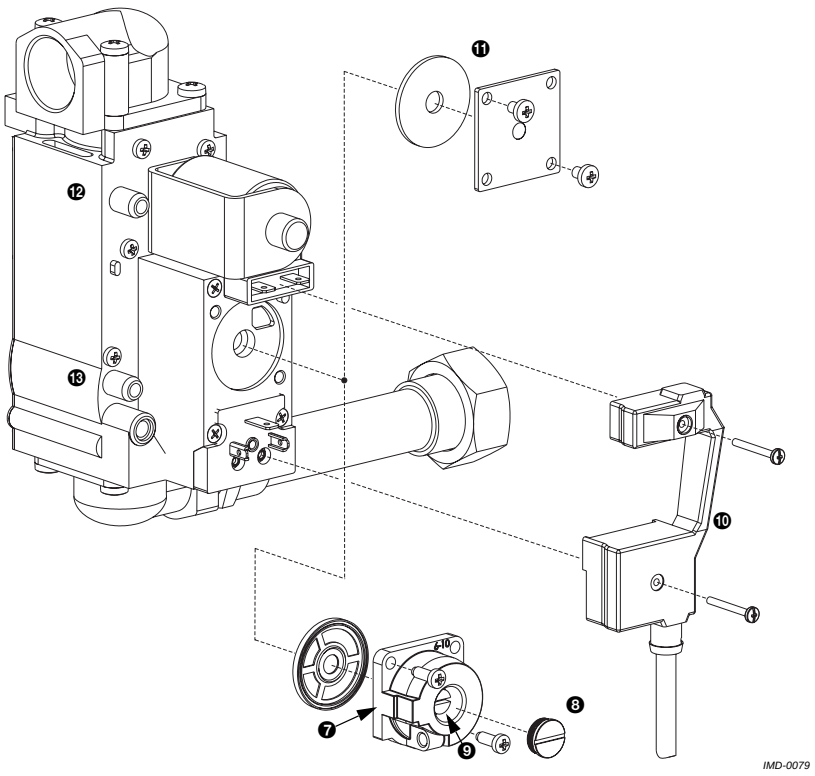


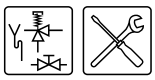
Figure 3.13 Conversion of gas control

Remark
In the event the supply pressure for a gas category is the same as the burner pressure (see the gas tables in paragraph 3.4) then the gas control must be fitted with a flat sealing plate with cork gasket. A burner pressure that deviates in comparison to the supply pressure requires the use of a burner pressure regulator with rubber gasket. Each conversion kit contains all the necessary components.

12. If the flat sealing plate or burner pressure regulator need to be replaced:
    - Unscrew the connector ❿ from the gas control.
    - If necessary, remove the flat sealing plate ⓫ or burner pressure regulator ❼.
    - If necessary, fit the flat sealing plate or burner pressure regulator supplied with the conversion kit.
    - Refit the connector to the gas control.
13. Refit the connector ❶ of the glow igniter and ionisation rod to the controller.
14. Re-fit the three-part gas coupling ❷.

Note
15. Check the burner and supply pressure (see paragraph 3.11).

16. Replace the plastic cover.
17. Remove the sticker showing the new gas category from the conversion kit, and attach it below the appliance's rating plate. This clearly indicates that the appliance may no longer be run on the gas for which it was originally supplied.
18. Start the appliance (see paragraph 7.2).



4 Filling and draining

4.1 Introduction

Topics covered in this chapter:

- Filling the appliance.
- Draining the appliance.

The components referred to in these paragraphs are illustrated in Figure 4.1.

4.2 Filling the appliance

4.2.1 Filling unvented installations

To fill the appliance, proceed as follows.

1. Open the stop valve ❾ in the hot water pipe and, if present, the stop valves ❹ for the circulation pump.
2. Shut drain valve ❼.
3. Open the nearest hot water draw-off point ⓬.
4. Open the supply valve ❾ on the cold water side Ⓐ so that cold water flows into the appliance.
5. Completely fill the appliance (when cold water flows at normal pressure from the nearest hot water draw-off point, the appliance is full).
6. Bleed the entire installation of air, for example by opening all hot water draw-off points.
7. The appliance is now under water supply pressure. There should be no water coming out of the overflow valve ⓲ nor the T&P valve❸. If this does happen, the cause might be:
   - The water supply pressure is greater than the specified 8 bar. Rectify this by fitting a pressure-reducing valve ❶.
   - The overflow valve in the protected cold supply setup is defective or incorrectly fitted.

4.2.2 Filling vented installations

To fill the appliance, proceed as follows.

1. Open the stop valve ❾ in the hot water pipe and, if present, the stop valves ❹ for the circulation pump.
2. Shut drain valve ❼.
3. Open the nearest hot water draw-off point ⓬.
4. Open the supply valve ❾ on the cold water side Ⓐ so that cold water flows into the appliance.
5. Completely fill the appliance (when cold water flows at normal pressure from the nearest hot water draw-off point, the appliance is full).
6. Bleed the entire installation of air, for example by opening all hot water draw-off points.
7. The appliance is now under water supply pressure. There should be no water coming out of the T&P valve ❸. If this does happen, the T&P valve might be defective or incorrectly fitted.

Legend

- ❶ pressure-reducing valve (mandatory)
- ❷ expansion vessel (mandatory)
- ❸ T&P valve (mandatory)
- ❹ stop valve (recommended)
- ❺ non-return valve (mandatory)
- ❻ circulation pump (optional)
- ❼ drain valve
- ❽ gas valve (mandatory)
- ❾ stop valve (mandatory)
- ❿ temperature gauge (optional)
- ⓫ condensation drainage (mandatory)
- ⓬ hot water draw-off points
- ⓭ pressure relief valve (mandatory)
- ⓮ water cistern
- ⓯ float valve
- ⓰ 3-way venting valve (recommended)
- ⓱ overflow pipe
- Ⓐ cold water supply
- Ⓑ hot water outlet
- Ⓒ circulation pipe
- Ⓓ gas supply
- Ⓔ flue gas discharge and air supply

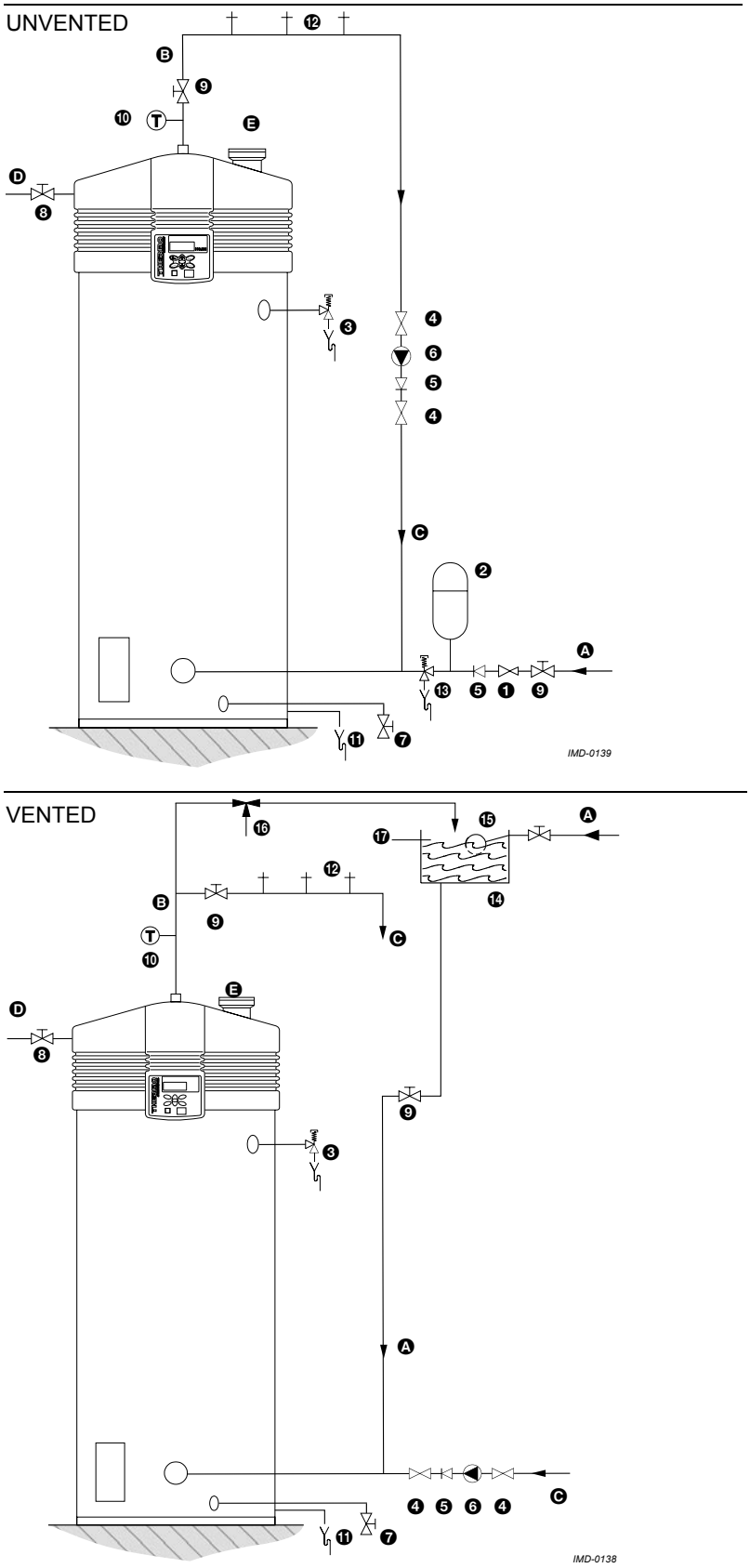


Figure 4.1 Installation diagrams

4.3 Draining the appliance

4.3.1 Draining unvented installations

Some service activities require the appliance to be drained. The procedure is as follows:

1. Activate the MENU with ⌓.
2. Use ↑ and ↓ to place the cursor beside OFF. See Figure 4.2.
3. Confirm OFF with **ENTER**.
4. Wait until the fan has stopped. The ⊜ icon is then dimmed.

Figure 4.2 Main menu

Note
Failure to wait until the fan stops can cause damage to the appliance.

5. Turn the appliance **OFF (position 0)** using the ON/OFF switch on the control panel. See Figure 4.3.
6. Disconnect the appliance by putting the mains switch between the appliance and the mains power supply to position 0.
7. Shut off the gas supply ❽.
8. Close the stop valve ❾ in the hot water pipe.
9. Close the supply valve of the cold water supply Ⓐ.
10. Open the drain valve ❼.
11. Bleed the appliance (or installation) so that it drains completely empty.

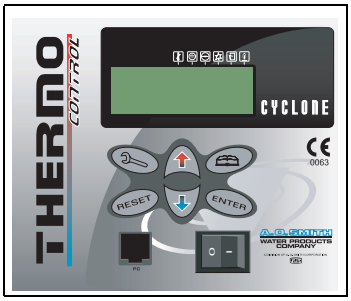


Figure 4.3 ThermoControl

4.3.2 Draining vented installations

Some service activities require the appliance to be drained. The procedure is as follows:

1. Activate the MENU with ⌓.
2. Use ↑ and ↓ to place the cursor beside OFF. See Figure 4.2.
3. Confirm OFF with **ENTER**.
4. Wait until the fan has stopped. The ⊜ icon is then dimmed.

Note
Failure to wait until the fan stops can cause damage to the appliance.

5. Turn the appliance **OFF (position 0)** using the ON/OFF switch on the control panel. See Figure 4.3.
6. Disconnect the appliance by putting the mains switch between the appliance and the mains power supply to position 0.
7. Shut off the gas supply ❽.
8. Close the stop valve ❾ in the hot water pipe.
9. Close the stop valve between the water cistern and the cold water inlet.
10. Open the drain valve ❼.
11. Bleed the appliance (or installation) so that it drains completely empty.

5 The control panel

5.1 Introduction

Topics covered in this chapter:

- 5.2 Operating;
- 5.3 Explanation of the icons;
- 5.4 ON/OFF switch of ThermoControl;
- 5.5 Navigation buttons;
- 5.6 PC connection..

5.2 Operating

Figure 5.1 shows the ThermoControl. The control panel is completely menu-driven. It comprises:

- a 4-line display with 20 characters per line;
- 6 push buttons for operating the appliance (below the display);
- 6 graphical symbols (above the display);
- a connector for a service PC;
- an ON/OFF switch.

The push buttons are divided into three groups:

- Navigation buttons:
  - Buttons UP ↑, and DOWN ↓;
  - Enter: **ENTER**;
  - Reset button: **RESET**
- The main menu: (see chapter '8 Main menu');
- the service program: (see chapter '9 Service program', this chapter is specifically intended for the service and maintenance engineer and installer).

Figure 5.1 ThermoControl

In this manual, the display of the ThermoControl is shown as in Figure 5.2, both with and without icons.

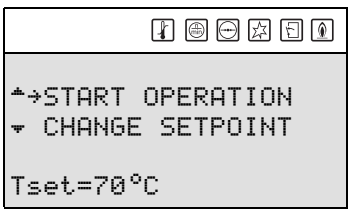


Figure 5.2 The display

5.3 Explanation of the icons

Table 5.1 gives an explanation of the icons.

Table 5.1 Icons and their meaning

Icon	Name	Explanation
	Heat demand	Heat demand detected
	Purge	Pre- and post-purge using fan
	Pressure switch	Pressure switch is closed
	Glow	(Pre)glow
	Gas control	Gas control open / ignition
	Flame detection	Appliance running

5.4 ON/OFF switch of ThermoControl

The ON/OFF switch of the ThermoControl switches the appliance ON and OFF. Note that in the OFF position the appliance remains electrically live, in order for the continuous pump to stay running.

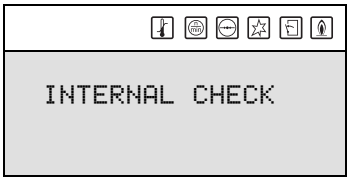


Figure 5.3 Internal check

After switching on, the text INTERNAL CHECK appears on the display for about 10 seconds. The main menu then appears (see chapter '8 Main menu'). If no selection is made in the main menu, the appliance automatically switches to OFF mode. See paragraph '6.2 Operating modes'.

Remark
To electrically disconnect the appliance, you must use the main switch between the appliance and the mains power supply.

5.5 Navigation buttons

The use of these buttons is explained with the help of Figure 5.4. This figure shows the main menu. See also chapter'8 Main menu'.

The navigation buttons are:

- Buttons UP ↑ and DOWN ↓;
- Enter: **ENTER**;
- Reset button: **RESET**

The arrows ▲ and ▼ indicate that you can scroll up and/or down. Use buttons ↑ and ↓ to scroll.

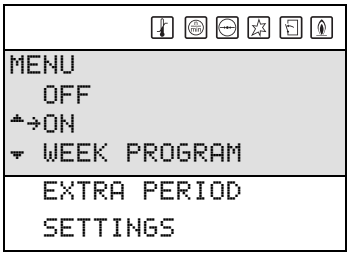


Figure 5.4 Navigation buttons

The cursor → points to the option to be activated. In the display as shown in Figure 5.4 you can scroll through the main menu.

The main menu consists of: OFF, ON, WEEK PROGRAM, EXTRA PERIOD and SETTINGS. The options EXTRA PERIOD and SETTINGS only become visible after scrolling downwards.

The selected option is confirmed using **ENTER**.

With the **RESET** button, you go back one page in a menu, and all options selected in the current menu are lost.

Remark
The **RESET** button is also used to reset the appliance following an error.

5.6 PC connection.

The PC connection is exclusively intended for technicians from A.O. Smith who can read the status and history of the appliance. These details can be important for troubleshooting and/or responding to complaints.

6 Status of the appliance

6.1 Introduction

Topics covered in this chapter:

- 6.2 Operating modes;
- 6.3 Error conditions;
- 6.4 Service condition.

6.2 Operating modes

When running, the appliance has four basic operating modes, namely:

OFF

In this mode, the frost protection is activated. Figure 6.1 shows the display with the following information:

- line one: the text OFF;
- line two: the time, the day and alternately T_1 and T_{net}. See paragraph 2.3;
- lines three and four: the text FROST PROTECTION ACTIVATED.

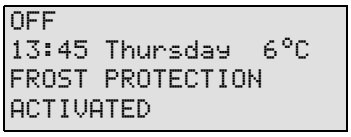


Figure 6.1 Frost protection

ON

In this mode the appliance continuously fulfils the demand for hot water. Figure 6.2 shows the display with the following information:

- line one: the text ON;
- line two: the time, the day and alternately T_1 and T_{net}. See paragraph 2.3;
- line three: the programmed water temperature T_{set};
- line four: is empty when the appliance is idle, or depending on the heating cycle, a text such as HEAT DEMAND. See '7.4 The appliance's heating cycle'.

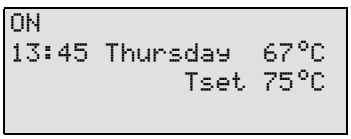


Figure 6.2 ON

EXTRA

In this mode, one extra period is programmed and activated. In this mode, the OFF or PROG position is temporarily overruled to fulfil a single period of heat demand. Once the period has passed, the appliance automatically returns to the previous operating mode. Figure 6.3 shows the display with the following information:

- line one: the text EXTRA;
- line two: the time, the day and alternately T_1 and T_{net}. See paragraph 2.3;
- line three: the switch-on time, and the related water temperature setting;
- line four: the text PERIOD ACTIVATED.

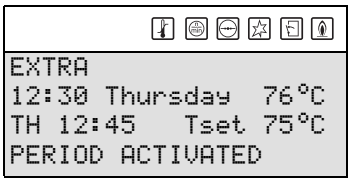


Figure 6.3 Extra period

PROG

In this mode a preset week program is active, and the appliance responds continually to heat demand within the time periods set in the week program. There are two distinct situations possible in this mode:

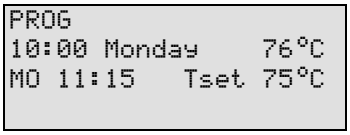


Figure 6.4 week program active, current time within programmed period

1) The current time falls within a set time period of the week program.
Figure 6.4 shows the display in this situation:

- line one: the text PROG;
- line two: the time, the day and alternately T_1 and T_{net}. See paragraph 2.3;
- line three: the next scheduled switch-off time and the water temperature T_{set} of the active period;
- line four: is empty, or depending on the heating cycle, a text such as HEAT DEMAND. See paragraph '7.4 The appliance's heating cycle'

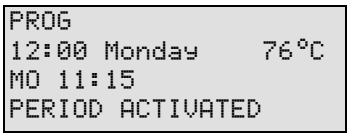


Figure 6.5 week program active, current time outside programmed period

2) The current time falls outside a set time period of the week program.
Figure 6.5 shows the display in this situation:

- line one: the text PROG;
- line two: the time, the day and alternately T_1 and T_{net}. See paragraph 2.3;
- line three: the next scheduled switch-on time;
- line four: the text PERIOD ACTIVATED.

In all modes, the temperature may at any moment drop below the desired temperature. The appliance then enters a heating cycle. This heating cycle is the same for all basic operating modes. See paragraph '7.4 The appliance's heating cycle'.

Remark
Setting and programming of the basic operating modes are described in chapter '8 Main menu'.

6.3 Error conditions

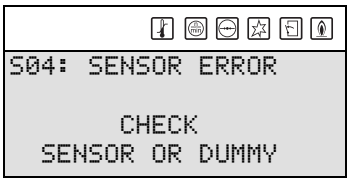


Figure 6.6 Example of an error message

Figure 6.6 shows an example of an error condition. If the appliance enters this condition, the display will show the following information:

- line one: error code comprising a letter and two digits, followed by the error description;
- lines two through four: alternately, a brief explanation of the error, and a brief action to resolve the error.

Note
The displayed action to resolve the error may only be performed by a service- and maintenance engineer.

There are various types of errors:

- LOCK OUT ERRORS
  When the cause is no longer present, these errors require a reset with the **RESET** button, before the appliance can resume running.
- BLOCKING ERRORS
  These errors disappear automatically once the cause of the error has been removed, after which the appliance resumes by itself.

The display does not show what type of error has been detected. For a detailed overview of error conditions, please refer to chapter '10 Troubleshooting'.

If, as end-user, you find the appliance in an error condition, you may attempt to re-start the appliance by pressing the **RESET** button once.

However, should the error return or become persistent, you should contact your service and maintenance engineer.

6.4 Service condition

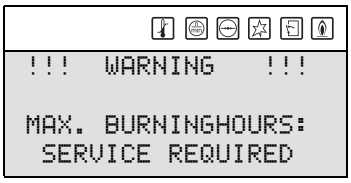


Figure 6.7 Service required

Figure 6.7 shows the message SERVICE REQUIRED. Should this message appear, then the appliance is in need of a service and maintenance inspection. In that case, contact your service and maintenance engineer.

Remark

The message SERVICE REQUIRED is based on the number of burning hours and the preset service interval. Should the service interval have been incorrectly selected, contact the service and maintenance engineer for instructions on how to adjust this. See chapter '11 Maintenance frequency'.

7 Starting up and shutting down

7.1 Introduction

Topics covered in this chapter:

- Starting up.
- Shutting down.

7.2 Starting up

Start-up the appliance as follows:

1. Fill the appliance. See chapter ’4 Filling and draining’
2. Open the gas valve (see ’Figure 4.1 Installation diagrams’).
3. Switch on the power to the appliance using the mains switch between the appliance and the power supply.
4. Turn the ThermoControl **ON** by setting ON/OFF switch to **position I**.

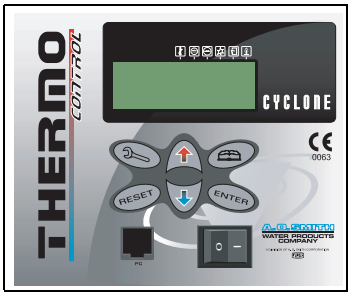


Figure 7.1 ThermoControl

The display will now show INTERNAL CHECK for about 10 seconds, then go to the main menu.

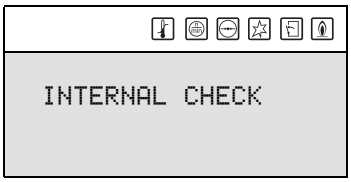


Figure 7.2 Internal check

5. Activate the “ON mode” by going through the following steps:
   - Press once on the DOWN button (🡻) to position the cursor (→) beside ON, then press **ENTER**. The display shown in figure Figure 7.4 will appear.

Figure 7.3 Main menu

   - Confirm with **ENTER** the option START OPERATION.

     The appliance will now enter “ON mode”. If there is a heat demand, the appliance will run through a heating cycle. See paragraph ’7.4 The appliance’s heating cycle’.

     If the heating cycle is not run, then there is no current heat demand; should this happen, then T_{set} will probably need to be set. This is described in paragraph ’8.4 Setting the water temperature’

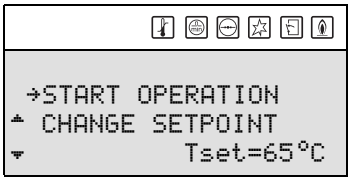


Figure 7.4 Starting up

7.3 Shutting down

You can:

- Shut the appliance down for a brief period (“OFF mode”).
- Disconnect the appliance from the mains.

- Shut the appliance down for a longer period.

7.3.1 Shut the appliance down for a brief period (“OFF mode”)

To shut the appliance down for a brief period, you must activate the frost protection.

With the frost protection you can prevent water freezing in the appliance.

Activate the frost protection as follows:

1. Press button to select the main menu.
2. Using ↑ and ↓ position the cursor (→) beside OFF.
   Confirm with ENTER.

The frost protection cuts in if the water temperature drops below 5°C. The text FROST will then appear on line one of the display The appliance will heat the water to 20°C (T_{set}) before dropping back to OFF mode.

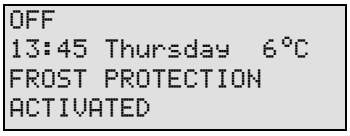


Figure 7.5 Frost protection

Remark
These values of 5°C and 20°C cannot be adjusted.

7.3.2 Disconnect the appliance from the mains

The appliance should only be disconnected from mains power in the correct way. The correct procedure is as follows:

1. Activate the MENU with .
2. Use ↑ and ↓ to position the cursor beside OFF. See Figure 7.6.
3. Confirm OFF with ENTER.
4. Wait until the fan has stopped. The icon is then dimmed.

Figure 7.6 Main menu

Note
Failure to wait until the fan stops can cause damage to the appliance.

5. Turn the appliance **OFF (position 0)** using the ON/OFF switch on the control panel. See Figure 7.7.
6. Disconnect the appliance by putting the mains switch between the appliance and the mains power supply to position 0.

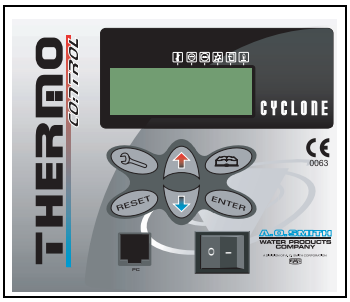


Figure 7.7 ThermoControl

7.3.3 Shut the appliance down for a longer period

Drain the appliance, if you are shutting it down for a longer period of time. Proceed as follows:

1. Disconnect the appliance from the mains as described in paragraph 7.3.2.
2. Shut off the gas supply.
3. Close the stop valve in the hot water pipe.
4. Open the drain valve.
5. Bleed the appliance (or installation) so that it drains completely empty.

7.4 The appliance's heating cycle

The appliance's heating cycle is activated as soon as the measured water temperature (T_{net}) falls below the threshold value (T_{set}). This threshold value depends on the currently selected appliance operating mode. For example, if the appliance is in the "OFF mode" (frost protection), then this value is 5°C. If the appliance is in the "ON mode", then this threshold value is selectable, for example, 65°C.

The heating cycle runs in turn through the following states:

1. HEAT DEMAND;
2. PRE-PURGE;
3. PRESSURE SWITCH;
4. PRE-GLOW;
5. IGNITION;
6. RUNNING;
7. POST-PURGE.

The complete cycle is explained in the example set out below assuming the appliance is operating in mode ON.

Remark
The same heating cycle applies to the other operating modes.

Once the appliance starts, it will run through 8 steps:

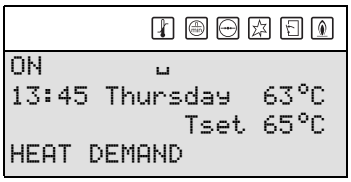


Figure 7.8 Frost protection cuts in

1. The water temperature drops below the set temperature of (for example) 65°C. The ThermoControl detects a heat demand and starts the heating cycle.
   - The icon is activated.
   - The message HEAT DEMAND appears.

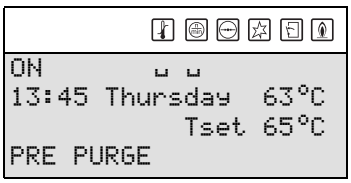


Figure 7.9 Pre-purge

2. Following the heat demand, the fan is powered up and the pre-purge begins. This lasts about 15 seconds. During this phase, any residual gases are removed.
   - The icon is activated.
   - The message PRE PURGE appears.

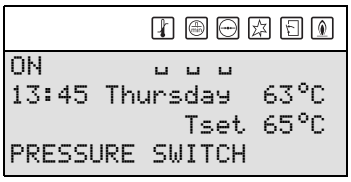


Figure 7.10 Pressure switch

3. During the pre-purge, the pressure switch closes.
   - The icon is activated.
   - The message PRESSURE SWITCH appears.

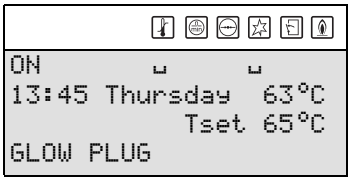


Figure 7.11 Pre-glow

4. After some time, the pre-purge ceases and the ThermoControl reduces the speed of the fan to the rotational speed for ignition. This is followed by the pre-glow of the glow igniter.
   - The and icons are dimmed.
   - The icon is activated.

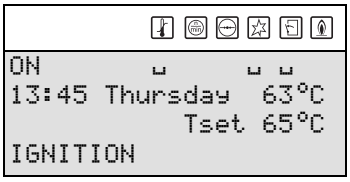


Figure 7.12 Ignition

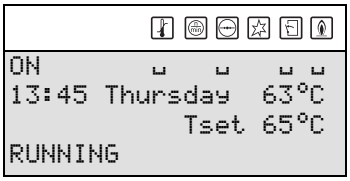


Figure 7.13 Running

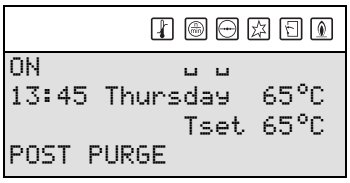


Figure 7.14 Post-purge

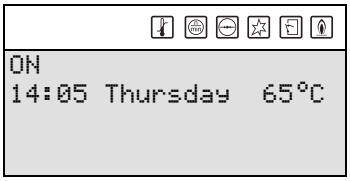


Figure 7.15 Running

5. After a number of seconds pre-glow, the gas control is opened and ignition takes place.
   - The icon is activated.
   - The message IGNITION appears.

6. After ignition, the flame is detected and the appliance will be running. This means that actual heating has started. The rotation speed of the fan then increases to the normal running speed, and the pressure switch will close:
   - The icon is dimmed.
   - The and icons are activated.
   - The message RUNNING appears.

7. Once the water is up to temperature, the heat demand drops off, and the post-purge starts. This lasts about 25 seconds.
   - The , and icons are dimmed.
   - The icon is activated.
   - The message POST PURGE appears.

8. Following the post-purge, the fan stops and the pressure switch opens:
   - The and icons are dimmed.
   - The message POST PURGE disappears.

At the first subsequent heat demand, the heating cycle will resume from step 1.

8 Main menu

8.1 Introduction

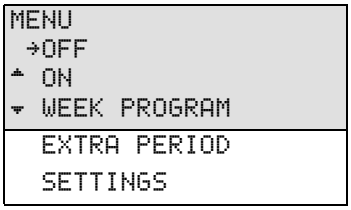


Figure 8.1 Main menu

The MENU is reached by pressing button ⌓ of theThermoControl. The options are:

- OFF

  Select this option if you wish to shut the appliance down for a brief period, but do not wish to drain it. In this mode, the frost protection is active. This prevents water from freezing in the appliance. See paragraph '7.3 Shutting down'.

- ON

  In this mode, the appliance continually responds to the hot water demand. See paragraph '8.3 Switching into "ON mode"'.

- WEEK PROGRAM

  Select this option to allow the appliance to respond to heat demand only during pre-programmed periods. Outside those periods, only frost protection is active. See paragraph '8.5 Week programme'.

- EXTRA PERIOD

  Select this option to override the OFF mode or PROG mode so that a single temporary period of heat demand will be fulfilled. See paragraph '8.6 Extra period'.

- SETTINGS

  Select this option in order to set the language and the time. You can also use this option to display the regulation interval (temperature), and the ignition and running speeds of the fan. See paragraph '8.7 Settings'.

Remark
If you fail to make any selection with the main menu open, then after 30 seconds, the appliance will automatically return to the mode it was previously in.

Topics covered in this chapter:

8.2 Notational convention for menu-related instructions

The MENU (⌓) of the ThermoControl is divided into sub-menus. For example, SETTINGS is one of the functions reached from the main menu. The menu SETTINGS is itself divided into sub-menus. For example, LANGUAGE is a sub-menu of SETTINGS. So, for example, to select menu LANGUAGE, this manual employs the following convention:

- ⌓: SETTINGS | LANGUAGE
  Confirm with **ENTER**.

This means:

1. 🕮: Activate the main menu with 🕮.
2. SETTINGS: Using button ↑ and/or ↓ go to SETTINGS and press **ENTER**.
3. LANGUAGE: Using button ↑ and/or ↓ go to LANGUAGE.
4. Confirm with **ENTER**: After pressing **ENTER**, the sub-menu LANGUAGE is activated.

This notation is also used for more than 2 sub-menus.

8.3 Switching into "ON mode"

You can switch the appliance into "ON mode" from any operational mode, as follows:

- 🕮: ON | START OPERATION

  Confirm with **ENTER**.

Remark
Starting up and shutting down the entire appliance is described in chapter 7.

8.4 Setting the water temperature

8.4.1 Setting the water temperature via SETPOINT MENU

The water temperature can be set to any value between 40°C and 80°C.

Set the water temperature via:

```
  START OPERATION
▲→CHANGE SETPOINT
▼          Tset=65°C
```

Figure 8.2 Setting SETPOINT

1. 🕮: ON | CHANGE SETPOINT

   Confirm with **ENTER**.

```
SETPOINT

     → 65°C
```

Figure 8.3 Adjusting water temperature

2. Use:
   - ↑ to increase the value;
   - ↓ to decrease the value.
   - Confirm with **ENTER**. After confirming, the appliance enters "ON mode".

Remark
If the temperature setting is higher than the current water temperature, it is possible that the appliance does **not** immediately start heating. To prevent excessively frequent switching on and off, there is a heating margin. This margin is set standard to 2°C. The appliance starts heating when the water temperature is 2°C colder than the SETPOINT and continues heating until the water is 2°C hotter than the SETPOINT.
We refer to this margin as the hysteresis. The service and maintenance engineer can adjust this value (see paragraph 9.2).

8.4.2 Setting water temperature during ON mode

```
ON
13:45 Thursday  65°C
          Tset=65°C
```

Figure 8.4 ON mode: the appliance is on

The water temperature can also be directly adjusted when the appliance is in "ON mode". Simply use:

- ↑ to increase the value;
- ↓ to decrease the value.
- t6Confirm with **ENTER**

8.5 Week programme

8.5.1 Introduction

Using the week program, you can set the water temperature for the days and times you wish.

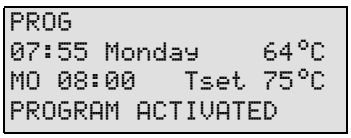


Figure 8.5 week program active

If the appliance is running under a week program, then this is indicated on the display by the text PROG on the first line (see Figure 8.5). The second line shows the time of day, the day of the week and the temperature. The third line shows the next switching time of the week program and the programmed temperature. The fourth line shows the text PROGRAM ACTIVATED.

The appliance's default week program switches the appliance on every day at 00:00 hours and off at 23:59 hours. The water temperature setting is standard 65°C.

If you wish, you can change every setting in the standard week program of the appliance.

If, while the week program is running, the water temperature becomes too low, then the appliance will run through the heating cycle (see '7.4 The appliance's heating cycle'), then return to the week program.

The following topics are covered in this paragraph:

- 8.5.2 Starting up and shutting down the week program
- 8.5.3 Changing the appliance's standard week program
- 8.5.4 Adding times to a week program
- 8.5.5 Deleting times from a week program

8.5.2 Starting up and shutting down the week program

The week program can be started up from any other operating mode, as follows:

- : WEEK PROGRAM | START OPERATION
  Confirm with **ENTER**.

A week program can be shut down simply by activating a different operating mode, for example "ON mode".

8.5.3 Changing the appliance's standard week program

Remark
First fill-in the desired week program on the program card supplied. See appendix 'A.3 Week program card'.

A week program is made up of a number of programmable periods in which you can have the appliance switch on and off. A period consists of:

- switch-on time: day of the week, and time in hours and minutes;
- switch-off time: in hours and minutes;
- the water temperature setting;
- on/off setting for a program-controlled pump.

Remark
The switch-off time must always be followed by a switch-off time on the same day of the week. A maximum of **three** periods may be programmed per day. You can program a maximum of **21** periods per week.

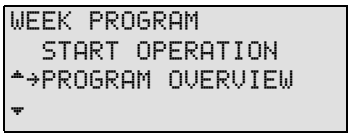


Figure 8.6 Week programme

Bring up the menu for the week program via:

1. : WEEK PROGRAM | PROGRAM OVERVIEW.
   Confirm with **ENTER**.

```
    DAY TIME  Tset
ON →SU  00:00 65°C P
OFF SU  23:59
ON  MO  00:00 65°C P
OFF MO  23:59
ON  TU  00:00 65°C P
OFF TU  23:59
ON  WE  00:00 65°C P
OFF WE  23:59
ON  TH  00:00 65°C P
OFF TH  23:59
ON  FR  00:00 65°C P
OFF FR  23:59
ON  SA  00:00 65°C P
OFF SA  23:59
   INSERT
   DELETE
   START OPERATION
```

Figure 8.7 Standard week program

The display now shows the menu for the week program, see Figure 8.7. With the default setting, the program switches on and off every day at 00:00 and 23:59 hours respectively, the water temperature is 65ºc and the pump is switched on (P).

Example

As an example, we will set the switch-on time for Sunday to 08:15 hours, and the matching switch-off time to 12:45 hours. The water temperature will be set to 75ºC and the pump will run continuously.
The following settings are entered one by one via the menu: the switch-on time, the switch-off time, the desired water temperature, and the state of the program-controlled pump.

```
ON  →SU 00:00
OFF  SU 23:59
Tset 65°C
PUMP ON       SAVE
```

Figure 8.8 Week programme

Setting the switch-on time

2. Bring the cursor to SU and press ENTER. The sub-menu shown in Figure 8.8 will appear. The day indicated by the → will blink.
3. Use ↑ and ↓ to select the day desired. In the example, this is SU (Sunday).
   Confirm with ENTER.
   The cursor moves to the hour digits, which will blink. See Figure 8.9.
4. Use ↑ and ↓ to select the hour. In the example this is 08.
   Confirm with ENTER.

```
ON   SU→08:00
OFF  SU 08:00
Tset 65°C
PUMP ON       SAVE
```

Figure 8.9 Setting switch-on hours in week program

The cursor moves to the minute digits, which will blink. See Figure 8.10.

Remark
Because the switch-off time can never be earlier than the switch-on time, the switch-off time setting is automatically adjusted with the switch-on time.

```
ON   SU 08→15
OFF  SU 08:15
Tset 65°C
PUMP ON       SAVE
```

Figure 8.10 Setting switch-on minutes in week program

5. Use ↑ and ↓ to select the minutes. In the example this is 15.
   Confirm with ENTER.
   The cursor moves to the switch-off hour digits, which will blink. See Figure 8.11.

Setting switch-off time

6. Use ↑ and ↓ to select the hour. In the example this is 12.
   Confirm with ENTER.

```
ON   SU 08:15
OFF  SU→08:15
Tset 65°C
PUMP ON       SAVE
```

Figure 8.11 Setting switch-off hours in week program

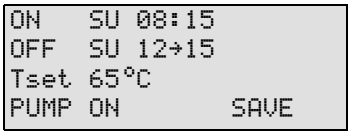


Figure 8.12 Setting switch-off minutes in week program

The cursor moves to the minute digits, which will blink. See Figure 8.12.

7. Use ↑ and ↓ to select the minutes. In the example this is 45.

   Confirm with **ENTER**.

   The cursor moves to the water temperature. See Figure 8.13.

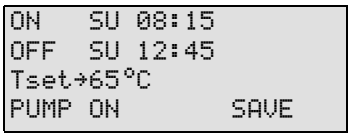


Figure 8.13 Setting water temperature in week program

Setting the water temperature

8. Use ↑ and ↓ to select the water temperature. In the example this is 75°C.

   Confirm with **ENTER**.

   The cursor moves to PUMP ON . See Figure 8.14.

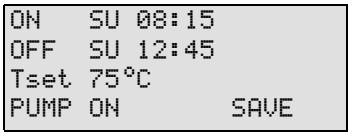


Figure 8.14 Setting the pump in week program

Setting program-controlled pump

9. If required, a pump can be controlled during the period. Use ↑ and ↓ to select PUMP ON . The pump ensures a regular circulation of hot water in the hot water pipes. You can skip this step if you there is no pump in your hot water circuit.

   Confirm with **ENTER**.

   The cursor moves to SAVE. See Figure 8.15.

10. Confirm with **ENTER**.

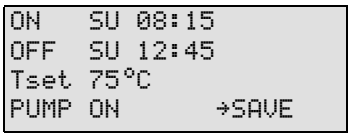


Figure 8.15 Save week program

The display shown in Figure 8.16 appears.

11. If you wish, use ↓ to scroll to another day, and change more switch-on and switch-off times. Simply repeat steps 3 through 10.
12. After changing all desired switch-on and switch off times, you can start running the week program:
    - Scroll with ↓ to START OPERATION.
      Confirm with **ENTER**.

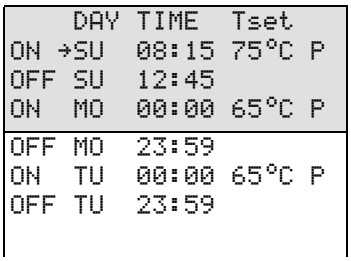


Figure 8.16 Add week program

8.5.4 Adding times to a week program

The menu to INSERT switch-on and switch-off times into a week program is reached via:

1. ⌓: WEEK PROGRAM | PROGRAM OVERVIEW.

   Confirm with **ENTER**.

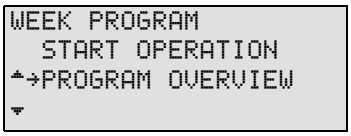


Figure 8.17 Inserting a week program

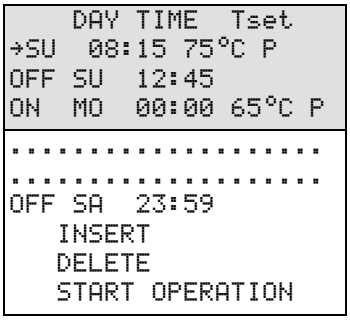


Figure 8.18 Week programme

The display shows the menu for the week program, see Figure 8.18. The cursor points to the active period.

2. Scroll ↓ to INSERT.

   Confirm with **ENTER**.

The sub-menu for adding a period will appear. See Figure 8.19.

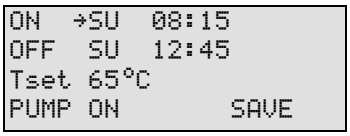


Figure 8.19 Adding a period

Example

As an example, we will program an extra period in which the switch-on time is set to 18:00 hours, and the matching switch-off time to 22:00 hours. The water temperature will be set to 75ºC and the pump will run continuously.

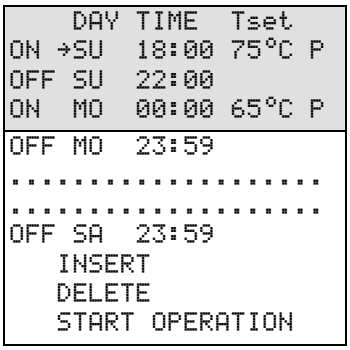


Figure 8.20 Period added

3. Repeat steps 3 through 10 of paragraph 8.5.3. After the option SAVE the display as shown in Figure 8.20 appears; i.e. with the cursor beside the period we have just added.
4. To activate the week program with the new period added, scroll down with ↓ to START OPERATION and confirm with **ENTER**.

8.5.5 Deleting times from a week program

All switch-on/off times are shown sequentially in the display. Assume that the switch-on/off times for the appliance are programmed as in Figure 8.21.

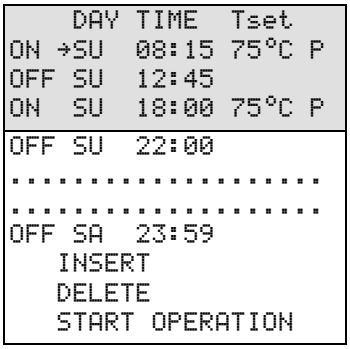


Figure 8.21 A program

To delete a period, proceed as follows:

1. : WEEK PROGRAM.

   Confirm with **ENTER**.

Figure 8.22 Week programme

```
WEEK PROGRAM
  START OPERATION
*→PROGRAM OVERVIEW
▼
```

Figure 8.23 week program options

2. Scroll with ↓ to PROGRAM OVERVIEW.

   Confirm with **ENTER**.

   The display will show the week program sub-menu, see Figure 8.21.
3. Scroll with ↓ to DELETE.

   Confirm with **ENTER**.

```
    DAY TIME  Tset
ON !SU 08:15 75°C P
OFF SU  12:45
ON  SU  18:00 75°C P
OFF SU  22:00
.....................
.....................
OFF SA  23:59
   INSERT
   DELETE
   START OPERATION
```

Figure 8.24 A program

4. The display will change as shown in Figure 8.24. To warn you that you are now working in the delete sub-menu, the cursor is replaced with an exclamation mark (!) and the period settings will blink (illustrated in the figure by underlining).

```
    DAY TIME  Tset
ON !SU 18:00 75°C P
OFF SU  22:00
ON  MO  00:00 65°C P
OFF MO  23:59
.....................
.....................
OFF SA  23:59
   INSERT
   DELETE
   START OPERATION
```

Figure 8.25 Select

5. Scroll with ↓ to the day to be deleted. For example, the second period of SU (Sunday). See Figure 8.25.

   Confirm with **ENTER**.

```
    DAY TIME  Tset
ON !    DELETE
OFF     BLOCK?
ON  MO  00:00 65°C P
```

Figure 8.26 Confirm deletion of block from week program

6. The lines showing switch-on/off times are replaced by the text DELETE BLOCK?. See Figure 8.26.

   Confirm with **ENTER**
   (or use **RESET** to cancel deletion)

```
    DAY TIME  Tset
ON  SU  08:15 75°C P
OFF SU  12:45
ON  MO  00:00 65°C P
OFF MO  23:59
.....................
.....................
OFF SA  23:59
   INSERT
   DELETE
   START OPERATION
```

Figure 8.27 Period deleted

The switching period has been deleted. You will return now to the week program menu. The cursor is beside the first programmed period. See Figure 8.27.

7. Scroll with ↓ to START OPERATION.

   Confirm with **ENTER**.

   The week program is active.

8.6 Extra period

8.6.1 Introduction

Use an extra period when you either want to have the appliance switch on and off for a certain period, either without modifying the active week program, or without taking the appliance out of OFF mode (frost protection active).

If the appliance is running under an ‘extra period’, then this is indicated in the display with the text EXTRA. See Figure 8.28.

If the water temperature becomes too low during the extra period (see ’8.6.2 Programming an extra period’), the appliance will run through the heating cycle (see ’7.4 The appliance’s heating cycle’), then fall back into the extra period.

The same settings can be made for an extra period as for a week program period. See paragraph ’8.5.3 Changing the appliance’s standard week program’.

```
EXTRA
10:00 Monday    76°C
MO 11:15   Tset 75°C
PERIOD ACTIVATED
```

Figure 8.28 Extra period active

8.6.2 Programming an extra period

Bring up the menu for entering an extra period via:

```
MENU
  ON
▲ WEEK PROGRAM
▼→EXTRA PERIOD
```

Figure 8.29 Extra period

1. :EXTRA PERIOD

   Confirm with **ENTER**.

   The display show the settings for the extra period. See Figure 8.30.

Setting the switch-on time

```
ON   SU→08:00
OFF  SU 08:00
Tset 65°C
PUMP ON      START
```

Figure 8.30 Setting switch-on hour for extra period

2. Use ↑ and ↓ to select the day desired. In the example this is SU.

   Confirm with **ENTER**.

   The cursor moves to the hour digits, which will blink. See Figure 8.30.

3. Use ↑ and ↓ to set the switch-on hour to the desired value. In the example this is 08.

   Confirm with **ENTER**.

   The cursor moves to the minute digits, which will blink. See Figure 8.31.

```
ON   SU 08→15
OFF  SU 08:15
Tset 65°C
PUMP ON      START
```

Figure 8.31 Setting the switch-on minutes for extra period

> **Remark**
> Because the switch-off time can never be earlier than the switch-on time, the switch-off time setting is automatically adjusted with the switch-on time.

4. Use ↑ and ↓ to select the minutes. In the example this is 15.

   Confirm with **ENTER**.

   The cursor moves to the hour digits of the switch-off period. See Figure 8.32.

Setting switch-off time

```
ON   SU 08:15
OFF  SU→08:15
Tset 65°C
PUMP ON      START
```

Figure 8.32 Setting switch-off hour for extra period

5. Use ↑ and ↓ to select the hour. In the example this is 12.

   Confirm with **ENTER**.

   The cursor moves to the minute digits, which will blink. See Figure 8.33.

```
ON   SU 08:15
OFF  SU 12→15
Tset 65°C
PUMP ON      START
```

Figure 8.33 Setting the switch-off minutes for extra period

6. Use ↑ and ↓ to select the minutes. In the example this is 45.

   Confirm with **ENTER**.

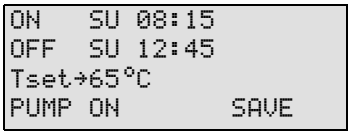


Figure 8.34 Setting water temperature for extra period

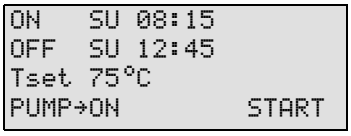


Figure 8.35 Pump setting for extra period

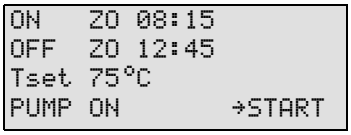


Figure 8.36 Saving extra period

The cursor moves to the water temperature. See Figure 8.34.

Setting the water temperature

7. Use ↑ and ↓ to select the water temperature. In the example this is 75.

   Confirm with **ENTER**.

   The cursor moves to PUMP ON. See Figure 8.35.

Setting program-controlled pump

8. If required, a pump can be controlled during the period. Use ↑ and ↓ to select PUMP ON. The pump ensures a regular circulation of hot water in the hot water pipes. You can skip this step if you there is no pump in your hot water circuit.

   Confirm with **ENTER**.

   The cursor moves to START. See Figure 8.36.

9. Confirm with **ENTER**.

The extra period has been programmed.

Remark

Once the extra period has completed running, the controller returns to the mode ON, OFF or WEEK PROGRAM. The following week, the extra period will **NOT** be automatically switched on.

8.7 Settings

8.7.1 Introduction

Using the option SETTINGS you can adjust certain settings, and display certain appliance specifications. See Table 8.1.

Table 8.1 Adjustable settings and displayable appliance specifications

Adjustable settings	• Menu language • Current day of week, and time
Displayable appliance specifications This category is only relevant to the installer and/or service and maintenance engineer.	• Regulation interval (water temperature). • Ignition speed of fan. • Running speed of fan.

8.7.2 Setting menu language

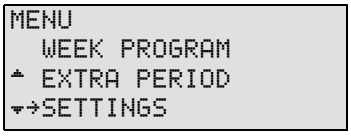


Figure 8.37 Settings

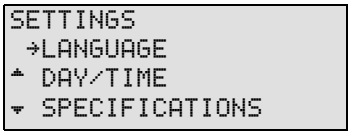


Figure 8.38 Language

Bring up the menu for selecting the language via:

1. : SETTINGS.

   Confirm with **ENTER**.

   The display shows the menu for settings. See Figure 8.38.

2. The cursor is positioned beside LANGUAGE

   Confirm with **ENTER**.

   The display shows the language selection menu. See Figure 8.39.

Figure 8.39 Language selection

3. Scroll with ↓ to the desired language.
   Confirm with **ENTER**.

The language is set.

8.7.3 Setting day and time

Bring up the menu for entering the day and time via:

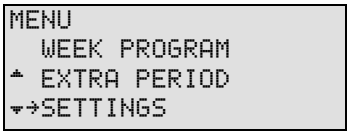


Figure 8.40 Settings

1. : SETTINGS.
   Confirm with **ENTER**.
   The display shows the menu for settings. See Figure 8.38.

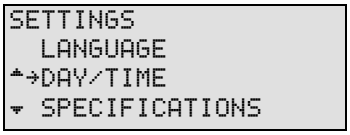


Figure 8.41 Day and time

2. Scroll with ↑ and ↓ to DAY/TIME
   Confirm with **ENTER**.
   The display shows the sub-menu for selecting the day of the week. See Figure 8.42.

Figure 8.42 Setting the day

3. The cursor is positioned beside Sunday.
   Scroll with ↑ and ↓ to the desired day.
   Confirm with **ENTER**.
   The day of the week has been set. The display shows the sub-menu for adjusting the time. See Figure 8.43.

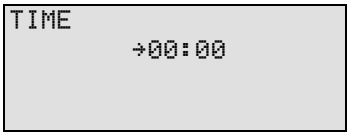


Figure 8.43 Setting the hour

4. The cursor moves to the hour digits, which will blink.
   Scroll with ↑ and ↓ to the current hour, for example 15.
   Confirm with **ENTER**.

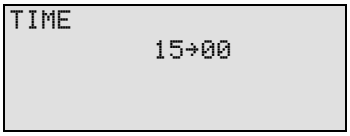


Figure 8.44 Setting the minutes

5. The cursor moves to the minute digits, which will blink.
   Scroll with ↑ and ↓ to the next minute in time, for example 45.
   Confirm the minute setting with **ENTER**.

The current time has been set.

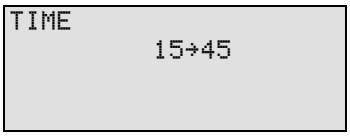


Figure 8.45 Setting the minutes

Remark
The appliance takes no account of daylight saving.

8.7.4 Displaying appliance specifications

Remark
This category is only relevant to the installer and/or service and maintenance engineer.

Table 8.2 shows the standard appliance specifications.

Table 8.2 Appliance specifications

Appliance	Ignition speed of fan	Running speed of fan	Regulation interval
BFC 28	4500 rpm	4980 rpm	40-80 °C
BFC 30	4500 rpm	5400 rpm	40-80 °C
BFC 50	4500 rpm	6000 rpm	40-80 °C
BFC 60	4500 rpm	6660 rpm	40-80 °C

Bring up the menu to display the appliance specifications via:

1. : SETTINGS.
   Confirm with **ENTER**.

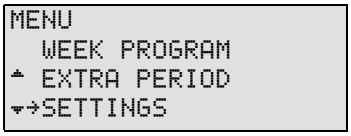


Figure 8.46 Main menu

2. Scroll with ↓ to SPECIFICATIONS
   Confirm with **ENTER**.
   The display shows the sub-menu for displaying appliance specifications. See Figure 8.48.

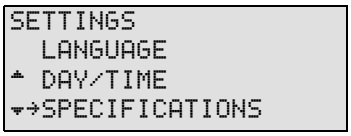


Figure 8.47 Settings

3. Scroll with ↓ to the section to be displayed, for example REGULATION INTERVAL.
   The relevant display specification appears, see Figure 8.49.

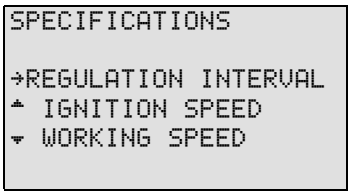


Figure 8.48 Appliance specifications

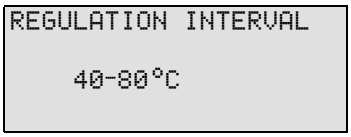


Figure 8.49 Regulation interval

9 Service program

9.1 Introduction

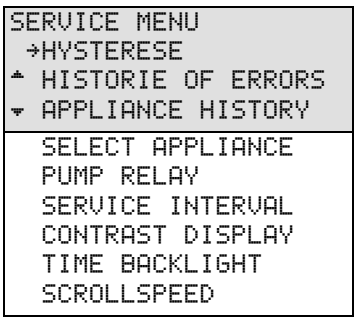


Figure 9.1 Service program

The service program is used by the installer or service and maintenance engineer for:

- Setting the hysteresis;
- Displaying the error history;
- Displaying the appliance history;
- Display the selected appliance;
- Setting the pump on/off;
- Setting the service interval;
- Setting the display contrast;
- Setting the backlight time;
- Setting the display scroll speed.

These sub-menus are briefly described in the following paragraphs. If you are not familiar in general with how to use the displays and menus, first read chapter '5 The control panel'.

Remark
The notation convention for the service menu is identical to that described in paragraph '8.2 Notational convention for menu-related instructions'. The difference is, you use ⊃ to bring up the service program, instead of ⌓ which brings up the main menu.

9.2 Setting the hysteresis

If the preset temperature (SETPOINT) is higher than the current water temperature, then the appliance might **not** immediately start the heating cycle (see chapter '7.4 The appliance's heating cycle'). To prevent excessively frequent switching on and off, a there is a heating margin. We refer to this margin as the hysteresis. The standard setting for this margin is 2°C. The heating cycle starts if the water temperature drops to 2°C below the SETPOINT and ends when the water reaches 2°C above the SETPOINT.

Figure 9.2 Heating cycle upper limit

Set the hysteresis via:

- ⊃: HYSTERESE UP

  Figure 9.2 shows an example.

Set the hysteresis via

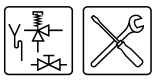
- ⊃: HYSTERESE DOWN

9.3 Displaying the error history

Display the error history via:

- ⊃: HISTORIE OF ERRORS

The controller will display an overview of 'Blocking errors' and 'Lock out errors'. In both cases, note that the ThermoControl reserves 15 lines for the last 15 error messages. If there are less than 15 error messages, then an ellipsis (...) is displayed. The display first shows the 'Blocking errors'. When **ENTER** is pressed, the 'Lock out Errors' are then displayed.



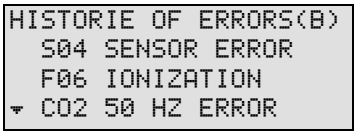


Figure 9.3 Blocking errors

Figure 9.3 shows an example of 'Blocking errors'. In this case, the text HISTORIE OF ERRORS is followed by (B).

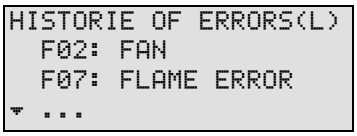


Figure 9.4 Lock out errors

Figure 9.4 shows an example of the 'Lock out errors'. In this case, the text HISTORIE OF ERRORS is followed by (L).

Remark
For an overview of all errors and the possible causes, please refer to chapter '10 Troubleshooting'.

9.4 Displaying the appliance history

The appliance history sub-menu is used to display the burning hours, the number of ignitions, the number of flame errors, and the number of ignition errors.

Bring up the menu for displaying the appliance history via:

- ⊃═: APPLIANCE HISTORY

  Figure 9.5 shows an example.

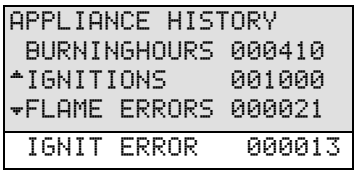


Figure 9.5 service program

9.5 Display the selected appliance

Bring up the menu for displaying the appliance selection via:

- ⊃═: SELECT APPLIANCE

  The appliance selection has been correctly preset in the factory.

  Figure 9.6 shows the relevant display.

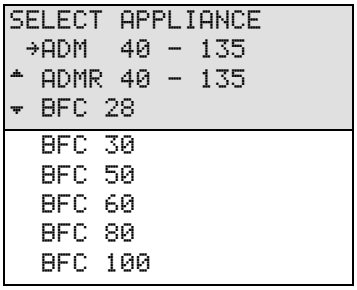


Figure 9.6 Select appliance

9.6 Setting the pump on/off

If a program-controlled pump is installed (Installation, see paragraph 3.10.6) then this can be turned ON or OFF via:

- ⊃═: PUMP RELAY

  The standard setting for the pump relay is OFF.

  Figure 9.7 shows the related display.

Figure 9.7 Pump relay

If the mode WEEK PROGRAM or EXTRA PERIOD is active, then the setting for mode WEEK PROGRAM or EXTRA PERIOD has priority over the ON/OFF selection for the pump relay in the service menu.

Example
One of the week program periods is currently active. The pump relay setting is OFF within this period. If the pump relay is set ON in the service menu, the pump will nonetheless remain OFF. The pump will only switch ON once the week program period has ended.

9.7 Setting the service interval

To aid servicing, the ThermoControl has a service interval which defines the frequency of maintenance by the service and maintenance engineer based on the number of burning hours. Refer also to paragraph 11.2.

The service interval is based on the number of burning hours. This can be set to 500, 1000 and 1500 hours. The standard setting for number of hours is 500. Once the preset number of hours is reached, a message to this effect will appear. See paragraph '6.4 Service condition'.

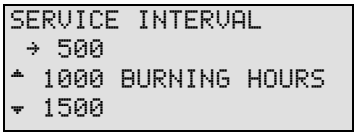


Figure 9.8 Service interval

Adjust the service interval via:

- ⊃: SERVICE INTERVAL

  Figure 9.8 shows the related display.

Refer also to paragraph '11.2 Determining service interval'.

9.8 Setting the display contrast

Adjust the display contrast via:

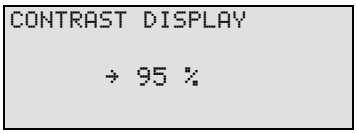


Figure 9.9 Display contrast

- ⊃: CONTRAST DISPLAY

  The standard setting is 100%. The range is from 0 through 100%.

  Figure 9.9 shows the related display.

9.9 Setting the backlight time

Adjust the backlight time (the time that the display backlight stays lit after the last button is pressed) via:

Figure 9.10 Backlight time

- ⊃: TIME BACKLIGHT

  The standard value is 255 sec. The range is from 0 through 255 seconds.

  Figure 9.10 shows the related display.

9.10 Setting the display scroll speed

Adjust the display scroll speed via:

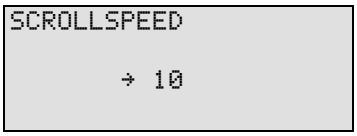
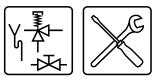


Figure 9.11 Scroll speed

- ⊃: SCROLLSPEED

  The standard setting is 10. The range is from 0 through 100. Setting the value too high or low will make scrolling difficult.

  Figure 9.11 shows the related display.



10 Troubleshooting

10.1 Introduction

A distinction is made between:

- **General errors**

  General errors are not reported on the display. General errors are:

  - Gas smell
  - Display does not light up
  - Insufficient or no hot water.
  - Water leakage
  - Explosive ignition

  Table 10.1 gives a troubleshooting overview for general errors.

- **Displayed errors**

  Errors are reported on the display, as follows:

  - Line 1: An error code and its short description. The code is made up of a letter and two digits.
  - Lines 2, 3 and 4: a long description, and a recommended action, alternating every 2 seconds. See Figure 10.1 and Figure 10.2.

Figure 10.1 Possible error

Figure 10.2 Action

The displayed errors are divided into two groups:

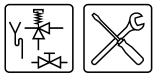
There are various types of errors:

- LOCK OUT ERRORS
  When the cause is no longer present, these errors require a reset with the **RESET** button, before the appliance can resume running.
- BLOCKING ERRORS
  These errors disappear automatically once the cause of the error has been removed, after which the appliance resumes by itself.

Table 10.2 gives a troubleshooting overview for the errors that appear on the display.

Remark
Footnotes referred to from within any table are shown at the bottom of the last page of that table.

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.



10.2 Troubleshooting table for general errors

Table 10.1 General errors (Sheet 1 of 3)

Symptom	Cause	Solution	Remark
Gas smell	Gas leak	**Warning** Immediately close the main gas valve. **Warning** Do not operate any switches. **Warning** No naked flames. **Warning** Ventilate the boiler room.	**Remark** Immediately contact your installer or local gas company.

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

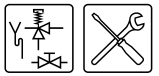


Table 10.1 General errors (Sheet 2 of 3)

Symptom	Cause	Solution	Remark
Display is off	Appliance is turned off.	Start-up the appliance. See ’7.2 Starting up’	
	No electric power present	1. Check whether the mains switch is ON. 2. Check that there is power to the mains switch. 3. Check whether the ON/OFF switch of the ThermoControl is ON (position I). 4. Check whether there is power to the electrical connection block. 5. The voltage measured must be 230 VAC (-15%, +10%).	See appendix ’A.2 Electrical diagram BFC’. If the error cannot be rectified, contact your installer.
	Defective fuse(s)	Replace fuse(s)	To replace the fuses you must contact your installer.
Water leakage	Leakage from one of the water connections (threaded).	Tighten the threaded connection.	If the leak persists, consult your installer.
	Condensation water leakage	Check that the condensation water discharge is working properly. Rectify if necessary.	
	Leakage from another nearby water appliance or pipe segment.	Trace the leak.	
	Leakage from the appliance’s tank.	Consult the supplier and/or manufacturer.	

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

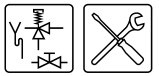


Table 10.1 General errors (Sheet 3 of 3)

Symptom	Cause	Solution	Remark
Explosive ignition	Incorrect supply pressure and/or burner pressure.	Set the correct supply pressure and/or burner pressure, see '3.11 Checking the supply pressure and burner pressure'.	If ignition is not improved, consult your installer.
	Contaminated burner	Clean the burner. See '12.4.2 Cleaning the burner'	
	Contaminated orifice.	Clean the orifice. See '12.4.3 Cleaning the orifice'	
Insufficient or no hot water.	Appliance is turned off.	Start-up the appliance. See '7.2 Starting up'	
	No electric power present.	1. Check whether the mains switch is ON. 2. Check that there is power to the mains switch. 3. Check whether the ON/OFF switch of the ThermoControl is ON (position I). 4. Check whether there is power to the electrical connection block. 5. The voltage measured must be 230 VAC (-15%, +10%).	See appendix 'A.2 Electrical diagram BFC'. If the error cannot be rectified, contact your installer.
	Hot water supply is used up.	Reduce hot water consumption and give the appliance time to heat up.	If there continues to be insufficient or no hot water, consult your installer.
	The controller is in OFF mode.	Put the controller in ON mode, see '8.3 Switching into "ON mode"'.	
	Temperature (T_{set}) is set too low.	Set temperature (T_{set}) to a higher value, see '8.4 Setting the water temperature'.	

10.3 Troubleshooting table for displayed errors

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

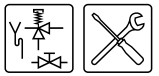


Table 10.2 Displayed errors (Sheet 1 of 10)

Code + Description	Possible cause	Solution	Remark
S01 (blocking error) Open circuit from temperature sensor T_2 at bottom of tank.	Sensor is not (correctly) connected.	Connect the sensor lead to JP3.	See appendix 'A.2 Electrical diagram BFC'.
	Damaged wiring or defective sensor.	Replace the sensor.	To replace the necessary parts, you must contact your installer.
S02 (blocking error) Open circuit from sensor 1 of temperature sensor T_1 at the top of the tank(1).	Sensor is not (correctly) connected.	Connect the sensor lead to JP5.	See appendix 'A.2 Electrical diagram BFC'.
	Damaged wiring or defective sensor.	Replace sensor T_1.	To replace the necessary parts, you must contact your installer.
S03 (blocking error) Open circuit from sensor 2 of temperature sensor T_1 at the top of the tank(1).	Sensor is not (correctly) connected.	Connect the sensor lead to JP5.	See appendix 'A.2 Electrical diagram BFC'.
	Damaged wiring or defective sensor.	Replace sensor T_1.	To replace the necessary parts, you must contact your installer.
S04 (blocking error) Open circuit from dummy 1.	Dummy is not (correctly) connected.	Connect the dummy sensor lead(2) to JP4.	See appendix 'A.2 Electrical diagram BFC'.
	Defective dummy.	Replace the dummy sensor.	To replace the necessary parts, you must contact your installer.
S05 (blocking error) Open circuit from dummy 2.	Dummy is not (correctly) connected.	Connect the dummy sensor lead(3) to JP4.	See appendix 'A.2 Electrical diagram BFC'.
	Defective dummy.	Replace the dummy sensor.	To replace the necessary parts, you must contact your installer.
S11 (blocking error) Short circuit from the temp. sensor T_2 at the bottom of the tank.	Short circuit in the sensor circuit.	Replace sensor T_2.	To replace the necessary parts, you must contact your installer.

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

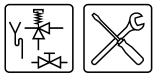


Table 10.2 Displayed errors (Sheet 2 of 10)

Code + Description	Possible cause	Solution	Remark
S12 (blocking error) Short circuit from sensor 1 of temperature sensor T_1 at the top of the tank	Short circuit in the sensor circuit	Replace sensor T_1.	To replace the necessary parts, you must contact your installer.
S13 (blocking error) Short circuit from sensor 2 of temperature sensor T_1 at the top of the tank	Short circuit in the sensor circuit	Replace sensor T_1.	To replace the necessary parts, you must contact your installer.
S14 (blocking error) Short circuit from dummy 1	Short circuit in dummy circuit	Replace the dummy sensor(2).	To replace the dummy sensor you must contact your installer.
S15 (blocking error) Short in circuit of dummy 2.	Short circuit in dummy circuit	Replace the dummy sensor(2).	To replace the dummy sensor you must contact your installer.

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

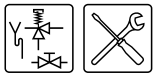


Table 10.2 Displayed errors (Sheet 3 of 10)

Code + Description	Possible cause	Solution	Remark
F01 (blocking error) Defect in power supply circuit.	Phase and neutral swapped in error.	Connect the phase and the neutral correctly. The appliance is phase-sensitive. See '3.10 Electrical connection'.	See appendix 'A.2 Electrical diagram BFC'.
	Condensation on the ionisation rod.	1. Disconnect the lead at the ionisation rod. 2. Ignite the appliance 3 times, with an interrupted ionisation circuit. 3. Reconnect the ionisation lead to the ionisation rod. 4. Ignite the appliance again 5. The repeated ignition attempts will have caused the condensation to evaporate.	If errors become persistent, contact your installer.
	Floating neutral.	Install an isolating transformer. See '3.10.4 Isolating Transformer'.	Contact your installer to have an isolating transformer installed.
F02 (lock out error) Fan fails to run at correct speed.	Damaged wiring.	1. Check the wiring between the fan and the controller. 2. If any wires are damaged, the wiring harness must be replaced. 3. Reset the water heater controller.	To have the wiring replaced and a new fan fitted, you must contact your installer.
	Contaminated or blocked fan.	1. Check whether the fan is contaminated. 2. Check that the rotor can rotate freely. 3. Reset the water heater controller.	
	Because of a voltage drop in the mains power, the fan will not run at the correct speed.	1. Check the supply voltage. This must be 230 VAC (+10% -15%). 2. Reset the water heater controller.	

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

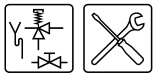


Table 10.2 Displayed errors (Sheet 4 of 10)

Code + Description	Possible cause	Solution	Remark
F03 (lock out error) The pressure switch fails to work correctly.	Damaged wiring / Open circuit	1. Check the wiring between the pressure switch and the controller. 2. If necessary, replace the wiring.	If the error cannot be resolved or is persistent, contact your installer. To replace the necessary parts, you must contact your installer.
	Pressure switch not closing.	1. Check the running speed of the fan. See '8.7.4 Displaying appliance specifications'. 2. Check that the hoses on the pressure switch and the air supply hose between fan and burner are correctly fitted. Refit these if necessary. 3. Check the hoses on the pressure switch and the air supply hose between fan and burner for cracks. If necessary, replace the hoses. 4. Check whether the flue gas discharge is compliant with Table 3.7. 5. Check for blockage in the flue gas discharge. Remove any blockage that may be present. 6. Check for blockage in the condensation water discharge. Remove any blockage that may be present. 7. Measure the pressure differential across the pressure switch. See Table 12.1. If there is insufficient pressure differential, clean the heat exchanger. If the pressure differential is acceptable, check that the pressure switch is closing, using a multimeter.	

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

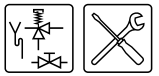


Table 10.2 Displayed errors (Sheet 5 of 10)

Code + Description	Possible cause	Solution	Remark
F04 (lock out error) Three unsuccessful ignition attempts.	No gas.	1. Open the main gas valve and/or the gas valve before the gas control. 2. Check supply pressure to the gas control. 3. If necessary, repair the gas supply.	To repair the gas supply, contact your installer.
	Air in the gas pipes.	Bleed the air out of the gas pipe.	See ’3.11 Checking the supply pressure and burner pressure’ for how to bleed air from the gas line, and measure the supply pressure and burner pressure. To replace the necessary parts, you must contact your installer.
	No burner pressure.	1. Check the burner pressure at the gas control. 2. Check that the gas valve(s) open and shut correctly. 3. If necessary, replace the gas control.	
	Defect in the glow igniter circuit.	1. Check that the glow igniter is correctly connected (JP2). 2. Check the wiring of the glow igniter. 3. Measure the resistance across the glow igniter. This must lie between 2 and 5 Ω. 4. Check that the glow igniter lights up during ignition. 5. If necessary, replace the glow igniter.	If the error persists, contact your installer. To replace the necessary parts, you must contact your installer.
	Defect in the ionisation circuit.	1. Check that the ionisation rod is correctly connected (JP2). 2. Check the wiring of the ionisation rod. 3. Measure the ionisation current. This must be a minimum of 1.5 µA. 4. If necessary, replace the wiring.	
	Supply voltage too low	Check the supply voltage to the appliance. This must be 230 VAC (+10% -15%).	

Warning
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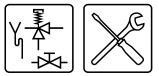


Table 10.2 Displayed errors (Sheet 6 of 10)

Code + Description	Possible cause	Solution	Remark
F05 (lock out error) Too many flame errors have been signalled.	Incorrect roof or wall terminal. Recirculating flue gases.	1. Check that the correct roof or wall terminal has been fitted. See '3.9 Air supply and flue gas discharge'. 2. If necessary, install the correct roof or wall terminal. 3. Check that the roof or wall terminal discharges into a permitted area.	If the error cannot be resolved or is persistent, contact your installer.
F06 (lock out error) Short circuit between ionisation rod and earth	Damaged cable in contact with metal surface.	Check the wiring of the ionisation rod. If necessary, replace the wiring.	If the error persists, contact your installer. To replace the necessary parts, you must contact your installer.
	Ceramic part of the ionisation rod is broken/cracked.	1. Check whether the ceramic part of the ionisation rod is still intact, in the vicinity of the air distribution plate of the burner. 2. If this is not the case, the ionisation rod must be replaced.	
F07 (lock out error) A flame has been detected after the gas valve was closed.	Defective gas valves.	1. Check whether there is still burner pressure present, after the gas valves have closed. 2. Check whether a flame is still present, after the gas valves have closed. 3. If this is the case, then the gas control must be replaced.	If the error cannot be resolved or is persistent, contact your installer. To replace the necessary parts, you must contact your installer.
F08 (lock out error) Error message from safety relay.	Flame detection before gas valve opened.	1. Reset ThermoControl. 2. If the error appears again, replace ThermoControl.	If the error cannot be resolved or is persistent, contact your installer. To replace the necessary parts, you must contact your installer.

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

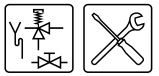


Table 10.2 Displayed errors (Sheet 7 of 10)

Code + Description	Possible cause	Solution	Remark
F09 (lock out error) Water temperature protection.	Temperature at the top of the tank exceeds 93°C.	1. Check that the circulation pump (if present) is working. 2. Check the position of the temperature sensor T_1. 3. Reset the water heater controller. **Remark** Error “F09” remains active in the event that the water temperature during a reset was higher than 78 °C. If this is the case, first draw water off by opening the nearest hot water tap, so that cold water can flow in.	If the error cannot be resolved or is persistent, contact your installer.
F10 (lock out error) Restriction on number of ignition attempts based on pressure switch state changes.	Pressure switch not closing.	1. Check the running speed of the fan. See ’8.7.4 Displaying appliance specifications’. 2. Check that the hoses on the pressure switch and the air supply hose between fan and burner are correctly fitted. Refit these if necessary. 3. Check for cracks in the hoses on the pressure switch and the air supply hose between fan and burner. If necessary, replace the hoses. 4. Check whether the flue gas discharge is compliant with Table 3.8. 5. Check for blockage in the flue gas discharge. Remove any blockage that may be present. 6. Check for blockage in the condensation water discharge. Remove any blockage that may be present. 7. Measure the pressure differential across the pressure switch. Table 12.1. If there is insufficient pressure differential, clean the heat exchanger. If the pressure differential is acceptable, check that the pressure switch is closing, using a multimeter. 8.	If the error cannot be resolved or is persistent, contact your installer. To replace the necessary parts, you must contact your installer.

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

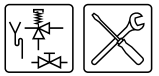


Table 10.2 Displayed errors (Sheet 8 of 10)

Code + Description	Possible cause	Solution	Remark
F11 (lock out error) Flame detection with closed gas valve.	Defective gas valves.	See F07.	

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

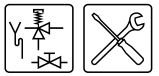


Table 10.2 Displayed errors (Sheet 9 of 10)

Code + Description	Possible cause	Solution	Remark
C02 (lock out error) Error message from the water heater controller.	Incorrect reference voltage from the AD converter.	1. Reset the ThermoControl. 2. Check that the frequency of the mains power complies with table 3.8. If this is not the case, contact your installer. 3. If the frequency is correct but the error persists, replace the ThermoControl.	To replace the necessary parts, you must contact your installer.
Internal error message from the water heater controller.	EEPROM read error.		
	50 Hz error.		
	Internal communication error		
Internal error message from the water heater controller.	Gas valve relay error.		
	Safety relay error.		
	Ignition relay error.		
	RAM error.		
	EEPROM error.		
	EEPROM contents do not match the software version.		
	Processor software error.		

Warning
Maintenance may only be performed by a qualified service and maintenance engineer.

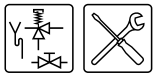


Table 10.2 Displayed errors (Sheet 10 of 10)

Code + Description	Possible cause	Solution	Remark
C03 (blocking error) Reset error.	Too many resets in too short a period.	Wait for the error to disappear (maximum 1 hour). If the error does not disappear, the water heater controller must be replaced.	To replace the necessary parts, you must contact your installer.
C04 (blocking error) Appliance selection error.	Incorrect appliance selection / Incorrect selection resistor.	1. Check whether the correct appliance has been selected. See '9.5 Display the selected appliance'. 2. If the correct appliance is selected, fit the correct selection resistor. 3. If incorrect appliance selected, select the correct one.	If the error does not disappear, you must contact your installer. To obtain a selection resistor, you must contact your installer.
E01 (blocking error) The temperature protection at the top of the tank has been activated.	The temperature of the water at the top of the tank is > 85°C.	None. This is a temporary message that may appear from time to time, but will disappear automatically.	
E03 (blocking error) Error in temperature sensor T_1 at the top of the tank.	The temperature differential between the two temperature sensors in the tank is ≥ 10°C over a period of 60 seconds or longer.	1. Check sensor position and wiring. 2. Reset the ThermoControl if necessary. Replace the sensor if the error persists.	To replace the necessary parts, you must contact your installer.
E04 (blocking error) Error in the dummy sensor(2).	The two dummy sensors detect a differential of ≥ 10°C over a period of 60 seconds or longer.	1. Check wiring from dummy 1 and dummy 2. 2. Reset ThermoControl if necessary. Replace the dummy sensor if the error persists.	To replace the dummy sensor you must contact your installer.

1. *Temperature sensor T_1 is a '2 in 1' sensor, T_1 contains 2 NTCs for the high-limit thermostat and safety thermostat protection.*
2. *The dummy sensor consists of dummy sensor 1 and dummy sensor 2*
3. *The dummy sensor consists of dummy sensor 1 and dummy sensor 2*

11 Maintenance frequency

11.1 Introduction

A service should be carried out at least once a year, both on the water side and on the gas side. Maintenance frequency depends, among other things, on the water quality, the average burning time per day and the set water temperature.

Remark
Regular maintenance extends the service life of the appliance.

Remark
To determine the correct maintenance frequency, it is recommended to arrange for the service and maintenance engineer to check the appliance on both the water and gas side, three months after installation. Based on this check, the best maintenance frequency can be determined.

11.2 Determining service interval

To aid servicing, the ThermoControl has a service interval which defines the frequency of maintenance by the service and maintenance engineer based on the number of burning hours.

The service interval can be set to: 500, 1000 or 1500 burning hours. The standard setting is 500 burning hours.

Example
In the first three months, the appliance has burnt 300 hours. During maintenance, it is evident that one service per year will be sufficient. So after one year, some 1200 burning hours will have elapsed. The first value below 1200 hours that can be selected is 1000 burning hours.

In this case, the service and maintenance engineer sets the interval to 1000.

Example
In the first three months, the appliance has burnt 300 hours. During maintenance, it is evident (perhaps due to the water quality) that service will be required at least once every 6 months. So after six months, some 600 burning hours will have elapsed. The first value below 600 hours that can be selected is 500 burning hours.

In this case, the service and maintenance engineer sets the interval to 500.

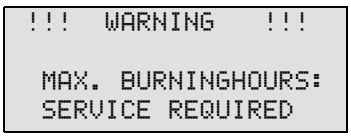
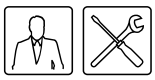


Figure 11.1 Service required

Once the set number of burning hours has elapsed, the message SERVICE REQUIRED will appear on the display. See Figure 11.1. Once the message appears. contact should be made with the service and maintenance engineer.



12 Maintenance

12.1 Introduction

Note
Maintenance may only by carried out by an approved service and maintenance engineer.

At each service, the appliance undergoes maintenance both on the water side and on the gas side. The maintenance should be carried out in the following order.

1. Preparation for maintenance;
2. Water-side maintenance;
3. Gas-side maintenance;
4. Finalising maintenance.

Remark
Before ordering spare parts, take a moment to write down the appliance type and model, and the full serial number of the appliance. Only by ordering with this information can you be sure to receive the correct spare parts. These details can be found on the rating plate.

12.2 Preparation for maintenance

To test whether all components are still working properly, you should complete the following steps:

1. Activate the MENU with .
2. Use ↑ and ↓ to position the cursor beside OFF. See Figure 12.1.
3. Confirm OFF with ENTER.
4. Wait until the fan has stopped. The icon is then dimmed.

Figure 12.1 Main menu

Note
Failure to wait until the fan stops can cause damage to the appliance.

5. Turn the appliance **OFF (position 0)** using the ON/OFF switch on the control panel. See Figure 12.2.
6. Turn the ThermoControl **ON** by putting the ON/OFF switch to **position I**.

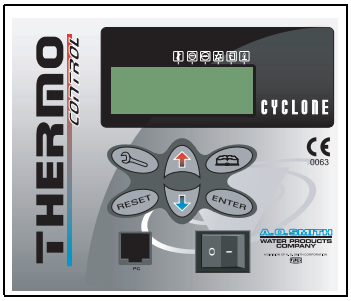


Figure 12.2 ThermoControl

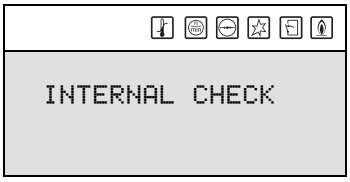


Figure 12.3 Internal check

The display will now show INTERNAL CHECK for about 10 seconds, and will then go to the main menu.

Figure 12.4 Main menu

7. Activate the “ON mode” by going through the following steps:
   - Press once on the DOWN button (↓) to position the cursor beside ON, then press **ENTER**. The display shown in Figure 12.5 appears.

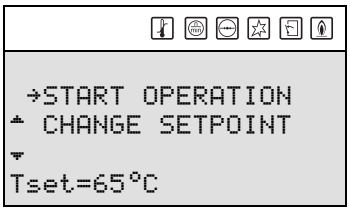


Figure 12.5 Starting up

   - Confirm with **ENTER** the option START OPERATION.
8. If there is no heat demand, increase T_{set}. See paragraph ’8.4 Setting the water temperature’ (take note of the original setting) and draw off some water to create a heat demand.
9. Check whether the heating cycle runs correctly. See paragraph ’7.4 The appliance’s heating cycle’.
10. If you adjusted T_{set}, return the setting to the original value. See paragraph ’8.4 Setting the water temperature’.
11. Remove the plastic cover on the top side of the appliance.
12. Check the supply and burner pressures and adjust these, where necessary. See paragraph ’3.11 Checking the supply pressure and burner pressure’.
13. Check that all components of the flue gas system are properly attached.
14. Check the pressure differential across the orifice plate of the pressure switch. See Table 12.1. If the pressure differential is too low, then the heat exchanger should be cleaned. See paragraph ’12.5 Finalising maintenance’.

Table 12.1 Pressure switch differential

Appliance	Observed pressure differential across the pressure switch (Pa)
BFC 28	≥ 635
BFC 30	≥ 885
BFC 50	≥ 885
BFC 60	≥ 1085

15. Test the operation of the overflow valve of the cold supply setup. The water should spurt out.
16. Test the overflow operation of the T&P valve. The water should spurt out.
17. Check the wastewater pipes of the overflow valves and remove any lime buildup that may be present.
18. Drain the appliance. See paragraph ’4.3 Draining the appliance’.

12.3 Water-side maintenance

12.3.1 Introduction

The following steps should be carried out on the water side:

1. Checking the anodes.
2. Descaling and cleaning the tank.
3. Cleaning condensation water discharge.

12.3.2 Checking the anodes

Timely replacement of the anodes extends the service life of the appliance. The appliance's anodes must be replaced as soon as they are 60% or more used up (take this into consideration when determining the maintenance frequency).

1. Loosen the anodes using suitable tools.
2. Check the anodes, and if necessary, replace them.

12.3.3 Descaling and cleaning the tank

Scale and lime buildup prevent effective conduction of the heat to the water. Periodic descaling prevents buildup of these deposits. This increases the service life of the appliance, and also improves the heating process. Take the rate of scale formation into account when deciding on maintenance frequency.

1. Remove the cover plate ❶ on the outer jacket. See Figure 12.6.
2. Undo the bolts.
3. Remove the cover and the gasket.
4. Inspect the tank and remove any contamination.
5. Remove the scale using Borcoil[1].
6. Close the cleaning opening.
   Use a new rubber gasket for this.

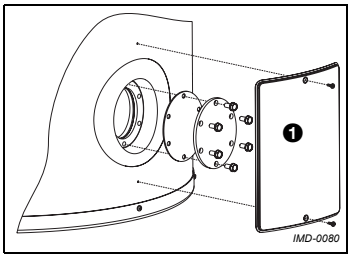


Figure 12.6 Cleaning opening

12.3.4 Cleaning condensation water discharge

It is essential to clean the condensation water discharge and siphon, to prevent blockages.

12.4 Gas-side maintenance

12.4.1 Introduction

The following steps should be carried out on the gas side:

1. Cleaning the burner.
2. Cleaning the orifice.
3. Finalising maintenance.

12.4.2 Cleaning the burner

1. Detach the burner.
2. Remove all contamination present on the burner.
3. Fit the burner.

1. *A.O. Smith recommends the use of Borcoil, as the composition of this material is known to us. Borcoil can be ordered from A.O. Smith.*

12.4.3 Cleaning the orifice

1. Detach the orifice.
2. Remove all contamination present in the orifice.
3. Fit the orifice.

12.4.4 Cleaning heat exchanger

1. Detach the burner.
2. Clean the combustion chamber of the heat exchanger using a vacuum cleaner and a soft brush.
3. Detach the flue gas discharge.
4. Clean the end of the heat exchanger using tap water.
5. Fit the burner.
6. Fit the flue gas discharge.

Remark
Check the pressure differential again after cleaning. If the pressure differential is too low following cleaning, please contact the supplier of the appliance.

12.5 Finalising maintenance

To finalise the maintenance carry out the following steps:

1. Fill the appliance. See paragraph '4.2 Filling the appliance'.
2. Re-start the appliance. See '7.2 Starting up'.
3. Remove the SERVICE REQUIRED message. Do this by: pressing **RESET** once, followed by **ENTER** once.

13 Warranty (Certificate)

To register your warranty, you should complete and return the enclosed warranty card after which a warranty certificate will be sent to you. This certificate gives the owner of a water heater supplied by A.O. Smith Water Products Company B.V. of Veldhoven, The Netherlands (hereinafter “A.O. Smith”) the right to the warranty set out below, defining commitments of A.O. Smith to the owner.

13.1 General warranty

If within one year of the original installation date of a water heater supplied by A.O. Smith, following verification, and at the sole option of A.O. Smith, a part or component, (with exclusion of the tank) proves to be defective or does not function correctly due to manufacturing and/or material defects, A.O. Smith shall replace or repair this part or component.

13.2 Tank warranty

If within 3 years of the original installation date of a water heater supplied by A.O. Smith, following inspection, and at the sole option of A.O. Smith, the glass-lined steel tank proves to be leaking due to rust or corrosion occurring on the water side, A.O. Smith shall provide an entirely new water heater of equivalent size and quality. The warranty period given on the replacement water heater shall be equal to the remaining warranty period of the original water heater that was supplied. Notwithstanding that stated earlier in this article, in the event that unfiltered or softened water is used, or allowed to stand in the water heater, the warranty shall be reduced to one year from the original installation date.

13.3 Installation and conditions of use

The warranty set out in article 1 and 2 will apply solely under the following conditions:

a. the water heater is installed under strict adherence to the installation instructions of A.O. Smith applying to the specific model, and the relevant local authority installation and building codes, rules and regulations in force;

b. the water heater remains installed at the original site of installation;

c. the appliance is exclusively used with drinking water, which at all times can freely circulate (a separately installed heat exchanger is mandatory for heating salt water or corrosive water);

d. the tank is safeguarded against harmful scaling and lime buildup by means of periodic maintenance;

e. the water temperatures in the heater do not exceed the maximum setting of the thermostats, which form a part of the water heater;

f. the water pressure and/or heat load do not exceed the maximum values stated on the water heater rating plate;

g. the water heater is installed in a non-corrosive atmosphere or environment;

h. the water heater is connected to a cold water supply arrangement, which is: approved by the relevant authority; with sufficient capacity for this purpose; supplying a pressure no greater than the working pressure stated on the water heater; and where applicable, fitted with a temperature and pressure relief valve compliant with the installation instructions of A.O. Smith pertaining to the specific model of water heater, and under adherence to the relevant local authority installation and building codes, rules and regulations in force;

i. the anodes are replaced and renewed no later than when 60% used up.

13.4 Exclusions

The warranty set out in article 1 and 2 will not apply, in the event of:

a. damage to the water heater caused by an external factor;

b. misuse, neglect (including frost damage), modification, incorrect and/or unauthorised use of the water heater and any attempt to repair leaks;

c. contaminants or other substances having been allowed to enter the tank;

d. the conductivity of the water being less than 125 μS/cm and/or the hardness (alkaline-earth ions) of the water being less than 1.00 mmol/lit (seeTable 3.3);

e. unfiltered, recirculated water flowing through or being stored in the water heater;

f. any attempts at repair to a defective water heater other than by an approved service engineer.

13.5 Scope of the warranty

The obligations of A.O. Smith pursuant to the specified warranty do not extend beyond free delivery from the Veldhoven warehouse of the replacement parts or components or water heater. Shipping, labour, installation and any other costs associated with the replacement will not be accepted by A.O. Smith.

13.6 Claims

A claim on grounds of the specified warranty must be submitted to the dealer from whom the water heater was purchased, or to another authorised dealer for the products of A.O. Smith Water Products Company. Inspection of the water heater as referred to in articles 1 and 2 shall take place in one of the laboratories of A.O. Smith.

13.7 Limitation of liability A.O. Smith

A.O. Smith grants no other warranty or guarantee over its water heaters nor the (parts or components of) water heaters supplied for replacement, other than the warranty expressly set out in this Certificate.

A.O. Smith is not liable for damage to persons or property caused by (parts or components, or the glass-lined steel tank of) a (replacement) water heater that it has supplied under the terms of this warranty, nor on any other grounds.

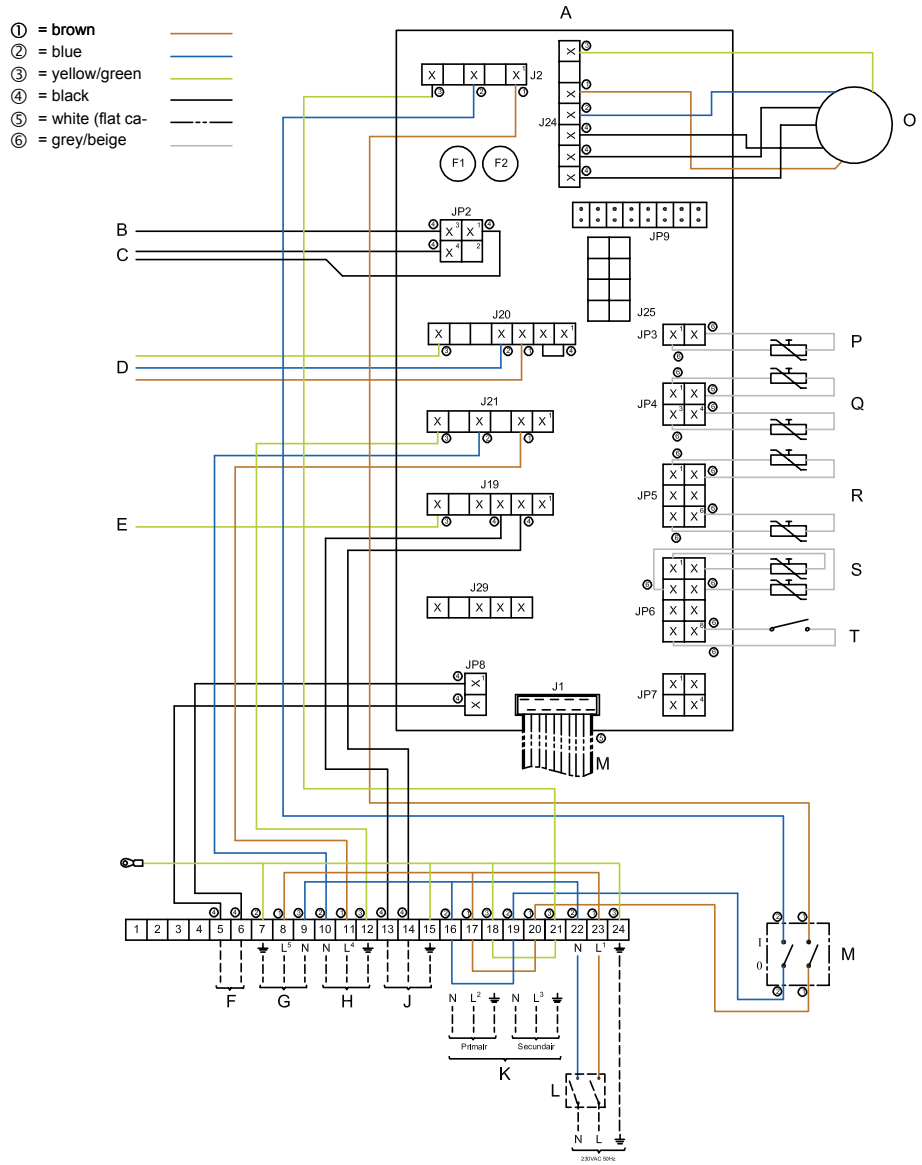
A Appendices

A.1 Introduction

This appendix contains:

- The Electrical diagram BFC.
- A Week program card.

A.2 Electrical diagram BFC



TERMINAL STRIP CONNECTIONS:

⏚ Earth
N Neutral
L^1 Phase input of controller
L^2 Phase input of isolating transformer (primary side)
L^3 Phase output of isolating transformer (secondary side)
L^4 Phase input of program-controlled pump
L^5 Phase input of continuous pump

COMPONENTS:

A Controller
B Ionisation rod
C Glow igniter
D Gas control
E Burner earth connection
F Extra ON mode switch
G Continuous pump
H Program-controlled pump
J Extra error signal
K Isolating transformer
L Double-pole mains switch
M ON/OFF switch control
N Display/Flat cable
O Fan
P Temperature sensor (T2 - bottom of tank)
Q Dummy
R Temperature sensor (T1 - top of tank)
S Selection resistor
T Pressure switch

CONTROLLER CONNECTIONS:

J1 Connector for display to controller
J2 Connector for power supply to controller
J19 Connector for extra error signal
J20 Connector for gas control
J21 Connector for program-controlled pump
J24 Connector for fan
JP2 Connector for ionisation rod and glow igniter
JP3 Connector for temperature sensor T2
JP4 Connector for dummy
JP5 Connector for temperature sensor T1
JP6 Connector for selection resistor and pressure switch
JP8 Connector for extra ON mode switch

F1 Fuse
F2 Fuse

Figure A.1 Electrical diagram BFC

A.3 Week program card

You can fill-in the week program card, cut it out and keep it near the appliance.

Period		DAY	TIME	Tset	Pump
1.	ON			.... °C	ON / OFF
	OFF				
2.	ON			.... °C	ON / OFF
	OFF				
3.	ON			.... °C	ON / OFF
	OFF				
4.	ON			.... °C	ON / OFF
	OFF				
5.	ON			.... °C	ON / OFF
	OFF				
6.	ON			.... °C	ON / OFF
	OFF				
7.	ON			.... °C	ON / OFF
	OFF				
8.	ON			.... °C	ON / OFF
	OFF				
9.	ON			.... °C	ON / OFF
	OFF				
10.	ON			.... °C	ON / OFF
	OFF				
11.	ON			.... °C	ON / OFF
	OFF				

Period		DAY	TIME	Tset	Pump
12.	ON			.... °C	ON / OFF
	OFF				
13.	ON			.... °C	ON / OFF
	OFF				
14.	ON			.... °C	ON / OFF
	OFF				
15.	ON			.... °C	ON / OFF
	OFF				
16.	ON			.... °C	ON / OFF
	OFF				
17.	ON			.... °C	ON / OFF
	OFF				
18.	ON			.... °C	ON / OFF
	OFF				
19.	ON			.... °C	ON / OFF
	OFF				
20.	ON			.... °C	ON / OFF
	OFF				
21.	ON			.... °C	ON / OFF
	OFF				

Example

Period		DAY	TIME	Tset	Pump
1.	ON	Monday	14:30	70 °C	ON / ~~OFF~~
	OFF	Monday	16:15		

IX Index