MIKROFILL®

Ethos 36 & 46

Installation and maintenance

Contents

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1 SAFETY PROVISIONS

1.1 Conditions:

MIKROFILL shall not be held responsible for damage arising from inadequate compliance with the installation instructions.
For service purposes, only original MIKROFILL spare parts should be used

1.2 General conditions:

All Mikrofill boilers must be installed by a competent person with regard to the relevant requirements of the Health and Safety regulations, The Building Regulations, IEE Regulations, Water Supply (Water Fittings) Regulations, Water Byelaws (Scotland), The Gas (Installation and Use) Regulations and any local planning requirements.

1. UK Building regulation Part L1 (Domestic) Part L2 (Commercial) in which reference is made to the following norms:

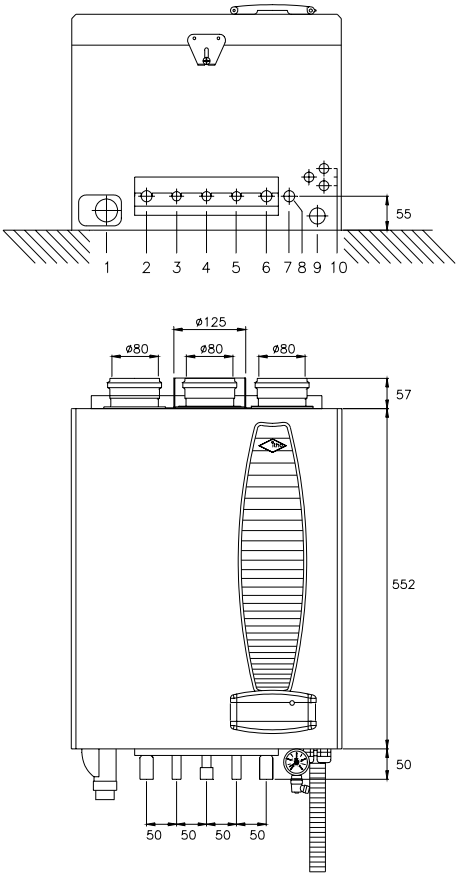
Directives for existing gas installations compiled by British Gas

2. IM16 Guidance notes on the installation of gas pipe work
3. BS6644 Installation of gas fired hot water boilers rated inputs above 60kW but not greater that 2 MW
4. British Standards Code of Practice – BS6880 – Code of practice for low temperature hot water heating
5. CP342 – Code of Practice part 2 – Centralised hot water supply

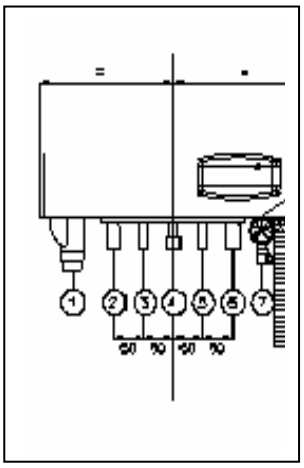
The Mikrofill ETHOS range of boilers are built in total compliance with EN

2 TECHNICAL DATA

2.1 Drawing of front view



1 = Condense trap end cap
2 = CH flow (22mm)
3 = Domestic hot water outlet (15mm)
4 = Gas
5 = Cold water inlet (15mm)
6 = CH return (22mm)
7 = Drain cock
8 = Pressure gauge
9 = Condense drain outlet
10 = Cable entry
11 = Not applicable
12 = Air intake (Not applicable on UK model)
13 = Air inlet concentric
14 = Flue gas spigot
15 = Air inlet spigot (Not applicable on UK model)



2.2 Technical data

Table 1, Technical data

General			
CE Product ID number	CE0063 BN 3374		
Dimensions (h x w x d)	550mm x 450mm x 350mm		
Category	II2H3P		
Type of appliance	Ethos	36	46
CH water content of appliance	Litre	2,1	2,7
CH water content DHW-heat exchanger	Litre	1,5	1,5
Weight (empty)	Kg	39	41
CH connections supply/return	mm	22	22
Gas connection	mm	15	15
Domestic Hot and cold water	mm	15	15
Flue gas connection	mm	80	80
Air inlet	mm	80	80
Concentric	mm	80/125	80/125
Electrical power required	W	115	115
IP classification		IP44	IP44

Capacity CH Operation			
Nominal Heat input (gross)	kW (min – max.)	4.3 – 28.5	5.4 – 38.7
Nominal Heat input (net)	kW (min – max.)	4.8 – 31.7	6.0 – 43
Max. gas use	m^3/hour	3.0	4,1
Efficiency at 50/30°C, full load	%	106	106
Efficiency at 50/30°C, partial load	%	109.5	109.5
Efficiency at 40/30°C, RAL-UZ 61	%	110	110
Nominal capacity at 80/60°C	kW	4.1 – 27	5.3 – 38
Nominal capacity at 50/30°C	kW	4.6 – 30	5.8 – 42
Gas approval HR Label		107	107
NOx emissions, RAL UZ 61	mg/kWh	<15	<15
CO emissions, RAL UZ 61	mg/kWh	<20	<20

Capacity Hot water			
Nominal Heat input (gross)	kW	4.3 – 36	5.4 – 46
Nominal Heat input (net)	kW	4.8 – 40.0	6.0 – 51.0
DHW flow rate at 60°C (ΔT=50K)	l/min	10	12.9
DHW flow rate at 40°C (ΔT=30K)	l/min	17	21.4
WRAS Approval number	0204111		
Annual use efficiency for EPC calculation	%	83	82
Hot water (preset value)	°C	60	60

Technical data			
CO_2 content flue gas	%	9	
Dew point of the flue gas	°C	52	
Temperature flue gas at 80/60 (with an ambient temperature of 20 °C)	°C	75	
Permitted resistance exhaust system*	Pa	Up to 100	
PH value of the condensate		4 to 5.5	
Available CH pump pressure	kPa	15 at ΔT20°C	28 at ΔT25°C
Maximum supply temperature	°C	90	
Working pressure CH min/max.	bar	1 - 3	
Connection pressure sanitary water min-max	bar	0.2 - 10	
NOx-class		6	

* Up to a resistance of 100 Pa the load will remain near enough equal, increased resistances will affect the values on the data plate.

3 INTRODUCTION

This manual is intended for the installer/user of the MIKROFILL range of condensing boilers. This manual contains the necessary information relating to the installation and settings of the Ethos 36 and 46.

You need to consult this manual before installation in order to ensure that you carry out all the work correctly. In addition, it is advisable to keep this manual beside the boiler, so it is immediately available if needed later.

3.1 Function of the appliance

High efficiency is achieved by means of a stainless steel heat exchanger, in which the flue gases are cooled to below the condensation point, condense and release further energy.

This is expressed in the efficiency exceeding 100%. The European method of calculation assumes an efficiency of 100% for appliances in which provision is not made for the condensation of flue gases and as a maximum efficiency of 110% in condensing appliances.

In condensing boilers the flue gases are at such a low temperature (below 75°C), a stainless steel or thick-walled aluminium (1) HR [HE] approved flue system or purpose designed plastic pipe needs to be used.

(1) When using an aluminium flue pipe, it is advisable to fit a condensation trap in the flue system, to prevent pollution by aluminium corrosion.

The appliance is approved in accordance to all associated European norms (CE), and the Netherlands requirements for Clean Air Combustion (SV), high efficiency (107% HR) and the quality mark (Gaskeur) as well as the quality mark for hot water (hot water class CW) and as reheater for solar panels (NZ approval).

3.2 Control

The boiler can be controlled by way of a conventional thermostat, or a modulating electronic room thermostat (OpenTherm ®), which can control the boiler output and modulate between 12% and 100% of the total output of the boiler.

The heat output is continuously adjustable ensuring that the output of the boiler maintains a constant temperature in the home irrespective of weather conditions and provides hot water (combination boilers only) at a constant temperature.

This variable heat output can also be achieved by means of the built-in weather-compensation, by way of an independent control or in conjunction with the above thermostats. All forms of control can be used with a conventional time clock.

3.3 Products of combustion

As a result of the variable combustion and the burner used, the results achieved for combustion comply with the strictest norms in Europe. Sedbuk A Rated, Ultra low Nox, Ultra low CO.

3.4 Modulating fan

An energy saving 24 Volt high efficiency fan is used with variable speed and current use. The fan speed decreases when the heat requirement is less, thus saving electricity.

3.5 Multi-speed pump

The appliance is fitted with a Grundfos pump (type UBS 15 – 60 HP) provided with a 3-speed switch for regulating the speed to enable the correct flow rate to be selected.

3.6 Description of appliance

The appliance is suitable for supplying a central heating installation. It has a variable capacity between 12 and 100%.

3.7 Combination Models

These boilers have a built-in heat exchanger with a limited provision for hot water supply. All connections are internal, while a built-in flow restrictor provides a maximum quantity of hot water maintaining a hot water temperature of approximately 60°C.

The hot water is set at 60°C to prevent contamination with “Legionella” bacteria.

4 INSTALLATION

4.1 Contents

The boiler and the following items should be included in the packaging:

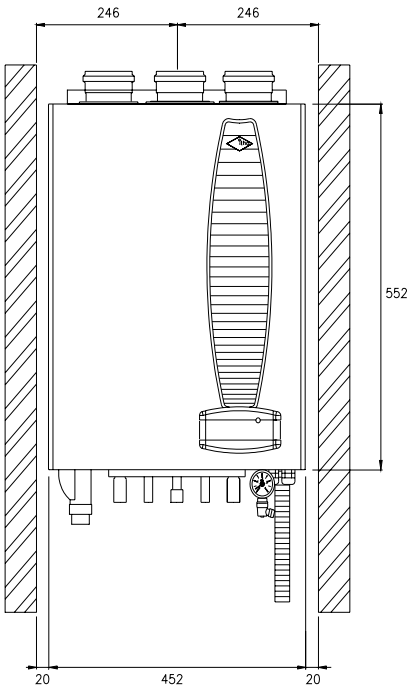
- Installation & Users’ Manual
- Vent key
- Mounting bracket
- 2 spare fuses and 3 spare burner plate nuts for fixing the burner plate (fixed on the front of the gas valve)
- Strainer siphon with tightening nut and packing

Check the contents immediately on receipt.

Any damage must be reported to the supplier immediately.

Mikrofill appliances are completely assembled

Mikrofill appliances are factory set for gas group G20.



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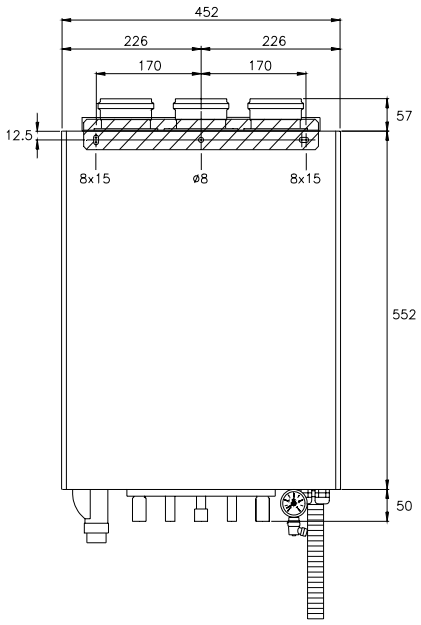
4.2 Siting the boiler

The flue, whether single or concentric, must be installed in compliance with the current flue recommendations BS5440

N.B. The siting should be dry and free of frost Combination boilers should be sited as close as possible to the hot water draw off point to avoid excessive water wastage.

N.B. The installer will need to select and install an expansion vessel, which will be sized according to performance requirements, along with a pressure relief valve.



For maintenance and service purposes the front and underside of the appliance need to be accessible; both sides need to be at least 20mm from a wall or cupboard wall.

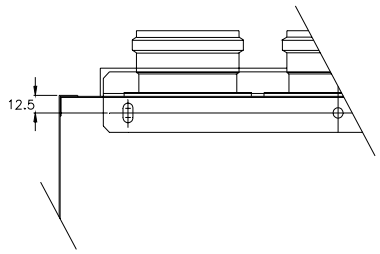
The following need to be available in the room where the appliance is to be mounted

a. 240v 1ph Electric.

b. A suitable drain for condensation water.

c. The wall on which the appliance is going to be mounted must be capable of bearing the weight of the appliance.

d. ETHOS boilers incorporate a modulating fan. Although noise levels are minimal care should be taken in siting the boiler to reduce disturbance from noise.



4.3 Mounting the boiler

a. Using the mounting bracket, mark the holes for the mounting plate and determine the position for connection of the inlet and outlet pipes..

Caution

Ensure the mounting bracket is level.

Caution

The head of the fixing bolt, must not be more than 6 mm.

b. Secure the mounting bracket to the wall using screws and plugs.

c. Drill the holes for air- and flueduct

d. Mount the boiler.

4.4 Air inlet-flue gas outlet connection

General

There are 2 options of flue connection:

A.: separate air inlet and flue outlet; (Standard method)

B.: concentric connection (pipe in pipe) (With the use of a Mikrofill flue adaptor).

A. Separate air inlet and flue outlet.

The optimum connection for air inlet and flue gas removal is achieved by using a corrosion-resistant inlet system.

The dimension of the flue gas outlet pipe is 80 mm; the air inlet is similarly 80 mm.

The air inlet can be placed on either the left or right hand side of the flue gas outlet pipe.

B. Concentric connection , a set is available for a concentric connection: air inlet 125 mm and flue gas outlet 80 mm diameter.
Always place the plastic inlet connection on top of the mouth of the air inlet pipe. This plastic connecting piece prevents damage to the appliance if there is moisture present in the inlet pipe
The air inlet with an 80 mm diameter, must be closed with the seal supplied with it.

4.5 Air inlet and flue outlet system.

The MIKROFILL boiler is a room sealed appliance that does not use any air from the room in which it is installed; the casing is air tight, so that oxygen is provided only through the air inlet pipe. The boiler must not be operated without the casing in place.

Note that horizontal parts need to have a gradient of 1% towards the boiler (1 cm per 1 m length). If this is overlooked, condensation can collect in the flue gas outlet pipe, which can cause problems.

The resistance of the inlet and outlet system is 100 Pa in instances where the resistance is greater than 100 Pa the maximum output of the boiler will be effected please refer to Figure 1

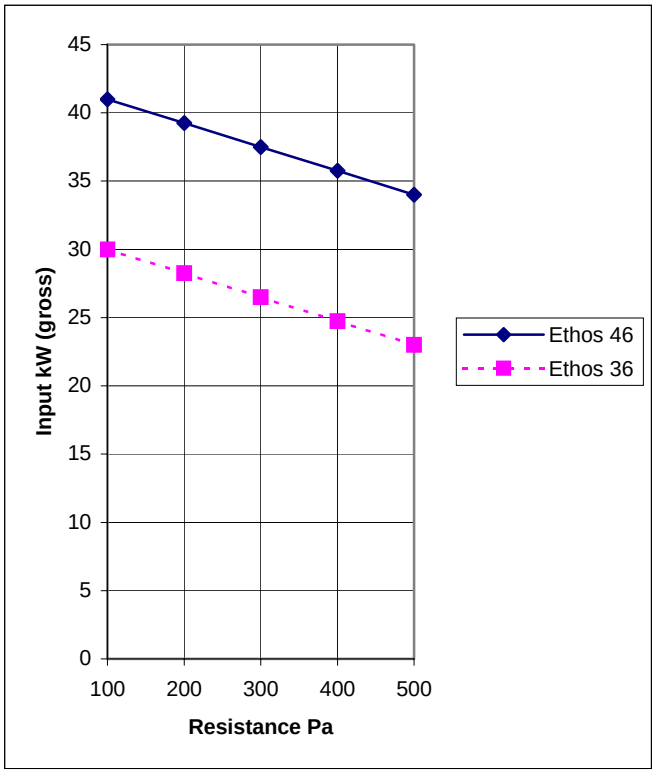


Figure 1

4.6 Influence of flue resistance on heat input

Figure 1 shows the ratio between the heat input and the resistance of the inlet and outlet resistance of the system.

Up to a resistance of 100 Pa the load will remain near enough equal, increased resistances will affect the values on the data plate.

The resistance and change in the load influence only the maximum and not the minimum load.

Take account of possible load changes with hot water production and the transmission calculation.

4.7 Flue material

The appliance must only be connected to systems manufactured from approved flue material and must incorporate water tight seals to eliminate leakage of condensate.

To avoid exterior nuisance pluming (mist) we thoroughly recommend vertical flueing.

Figure 1

4.8 Flue resistance table

The output of the appliance is influenced by the resistance of the air inlet and outlet system through the gas-air connection of the control of the appliance.

With a resistance up to **100 Pa.,** the load will be equivalent to what is shown on the data plate of the appliance.

Concentric Flue System		**(mm)**	**Resistance inlet-outlet system [Pa]**	
Part			ETHOS 36	ETHOS 46
Vertical Terminal		80/125	8,0	12.0
Horizontal Terminal		80/125	5,5	8.0
straight pipe/m		80/125	1.8	4.0
45° bend		80/125	0.9	2.0
90° bend		80/125	1.8	4.0
Two Pipe System		**(mm)**	**Resistance inlet-outlet system [Pa]**	
Air Inlet	**Part**		ETHOS 36	ETHOS 46
	straight pipe/m straight pipe/m plastic	80	1,0 4,0	2,5 7,0
	45° bend 45° bend plastic	80	0.5 2,0	1.2 3,5
	90° bend 90° bend plastic	80	1.0 4,0	2,5 7,0
Flue Gas Outlet	Vertical terminal	80	8,0	12.0
	Horizontal terminal	80	5,5	8.0
	straight pipe/m straight pipe/m plastic	80	2.0 6,0	4.0 11,0
	45° bend 45° bend plastic	80	1.0 3,0	2.0 5,5
	90° bend 90° bend plastic	80	2.0 6,0	4.0 11,0

Table 2, Flue resistance table

Example of calculation

Boiler type: ETHOS 36

Air inlet pipe: diameter 80 mm; horizontal length: 5 m; vertical 20 m; 2 x 90° bend
Flue gas outlet pipe: diameter 80 mm; horizontal length 5 m; vertical 20 m; 2 x 90° bend
Concentric vertical flue terminal 80/125

Air inlet:		**Resistance**
90° bend: 2 pieces	2 x 1.0	2 Pa
Straight pipe : 25m.	25 x1.0	25 Pa
Flue gas outlet		
90° bend: 2 pieces	2 x 2.0	4 Pa
Straight pipe 25m	25 x 2.0	50 Pa
Vertical terminal		8 Pa
		89 Pa

Total resistance is 89.0 Pa **(thus below 100 Pa)**

4.9 Removal of condensation

The condensation outlet is on the underside of the appliance, on the right, and has a ¾" diameter hose; place this flexible hose in the drain with an open connection .

N.B. Only use plastic parts for the condensation water outlet. Metal pipes are not permitted.

The appliance is provided with an in-built siphon, therefore the connection from the appliance can be directly linked with the water supply in the house.

WARNING: blockage of this outlet can cause damage to the appliance. The guarantee for the appliance does not cover any damage that arises in this way. In the correct situation the condensation water flows away visibly, for example via a tundish.

The appliance is constructed in such a way that if the siphon becomes blocked the appliance switches off before damage can occur to the burner.

4.10 Central heating and hot water circulation

4.10.1 General

If plastic pipes are used for supply and return, for radiators or under-floor heating, the pipes should incorporate an oxygen diffusion barrier. In the absence of this barrier it is essential that a Mikrofill air and dirt separator or similar appliance is installed. This is good practice even on steel/copper systems. This prevents contamination of the heat exchanger with system debris and magnetite caused by oxidation of the pipe work. The MIKROFILL guarantee may be invalidated by failure to comply.

4.10.2 CH-system

Combination boiler versions require an expansion vessel, safety relief valve and system isolating valves. Mikrofill can supply these

The boiler **doesn't** incorporate an internal bypass. If thermostatic valves are used in the system, a bypass must be made to guarantee sufficient water flow for a good operation of the boiler.

4.10.3 Connecting the expansion vessel.

An expansion vessel needs to be fitted with a volume suited to the contents of the central heating installation and static pressure; the expansion vessel is preferably fitted in the water return pipe work.

4.10.4 Domestic hot water circuit (Combination boilers only)

The boiler incorporates a domestic hot water flow control valve, which must be adjusted according to table 3 below to achieve a DHW-temperature of 60°C.

Connect the cold water supply according to the current UK water regulations (April 2000); it is advisable to fit a Mikrofill WRAS approved "quick fill loop" to enable recharging of the boiler water system

Table 3, DHW flow setting

Appliance	Setting
ETHOS 36	**10 l/min**
ETHOS 46	**13 l/min**

To achieve a tap water temperature of 45°C or higher within 30 seconds, the hot water pipe (15mm) between the boiler and the outlet must be not more than approximately 10 metres long.

4.10.5 Multi speed pump

The pump has a multi speed regulator which is set at the highest level: in the models ETHOS 36, 46, setting II will usually be sufficient: **Warning: Do not use level I,** because the flow rate will be insufficient.

The appliance has a built-in pump control with a delayed switch-off time of 3 minutes as standard.

If more heat is demanded the pump will operate at maximum capacity; when the heat demand ceases the pump will run for a further 3 minutes, and then stop.

Similarly the pump will run for 1 minute every 24 hours to reduce the possibility of the pump seizing due to debris in the system.

This 24-hour period begins the moment that the electrical power to the appliance is switched on.

4.11 Frost protection

The appliance has built-in frost protection, which activates the central heating pump when the water temperature in the boiler drops to 8°C.

At a boiler water temperature of 5°C, the burner ignites and fires until the CH-flow temperature reaches 10°C.

4.12 Connecting the gas supply

The gas supply must be suitable sized to ensure that there is no more than 1mbar of pressure drop from the meter to the appliance. This is a mandatory requirement

Check the gas pipe for leaks. If an inert gas i.e. nitrogen is to be used for the gas test, precautions must be taken to ensure that the maximum pressure in the gas system is below 100mbar.

For the fitting of the gas pipe and valve only, to test for gas leaks, a pressure of 100 mbar is briefly permitted.

Purge the gas pipe carefully, before the appliance is used for the first time.

5 ELECTRICAL INSTALLATION INSTRUCTIONS

Connection to mains voltage.

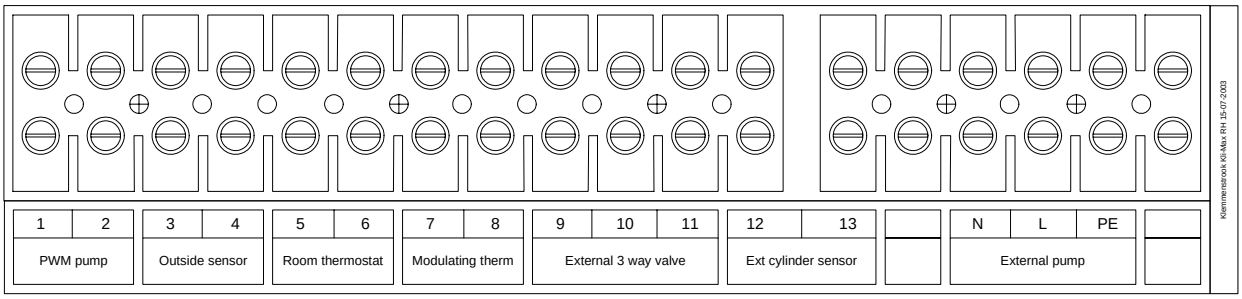
The appliance needs to be connected to an earthed 240v single-phase supply. Minimum cross-section is 3 x 0.75 mm²; the electrical installation must of course conform to the current regulations (see page 1).

A terminal board is provided for the further connections.

Care must be taken to ensure that the electrical isolator for this appliance is accessible at all times, so that, for servicing for example, the appliance can be disconnected from the power supply.

5.1 Terminal board

The following parts can be connected to the terminal connection board provided, see also the diagram below:



1-2 **PWM pump cable** for the modulating signal for a modulating domestic or CH pump.

3-4. **Outside temperature sensor /External sensor for weather compensation.** If desired, the CH installation can be regulated on the basis of the external temperature: if the external temperature drops, the water temperature in the boiler is increased; the water temperature in the boiler is therefore not subject to external influences such as the “sun” in the room, or an open fire.

A room thermostat can supplement this regulation.
If a room thermostat is not fitted, a wire loop needs to be fitted between terminals 5 and 6.

5-6. **Room thermostat/ Time clock/BMS control** can be connected here.
Maximum switch capacity is 2 VA. Anticipating resistor-setting 0,12A.
Max resistance RT-circuit is 10 Ohm.

7-8 **Modulating thermostat (open therm)**

Mikrofill has a series of, so-called OpenTherm ®, modulating thermostats in its range, with which the boiler modulation can be controlled.

9-10-11 **External three-way valve - 24V only**. If an external three-way valve is connected for an indirect cylinder for instance, the three-way valve motor needs to be connected here; in which case terminal 9 is the neutral terminal, and terminals 10 and 11 are intended for the 24 V AC Power open/Power closed respectively.

9-10

These terminals can also be used for other 24V AC supply not exceeding 3VA

12-13 If an **external cylinder** is connected, a cylinder sensor or a thermostat can be connected here.
If a sensor is connected, the cylinder temperature can be read on the boiler display.

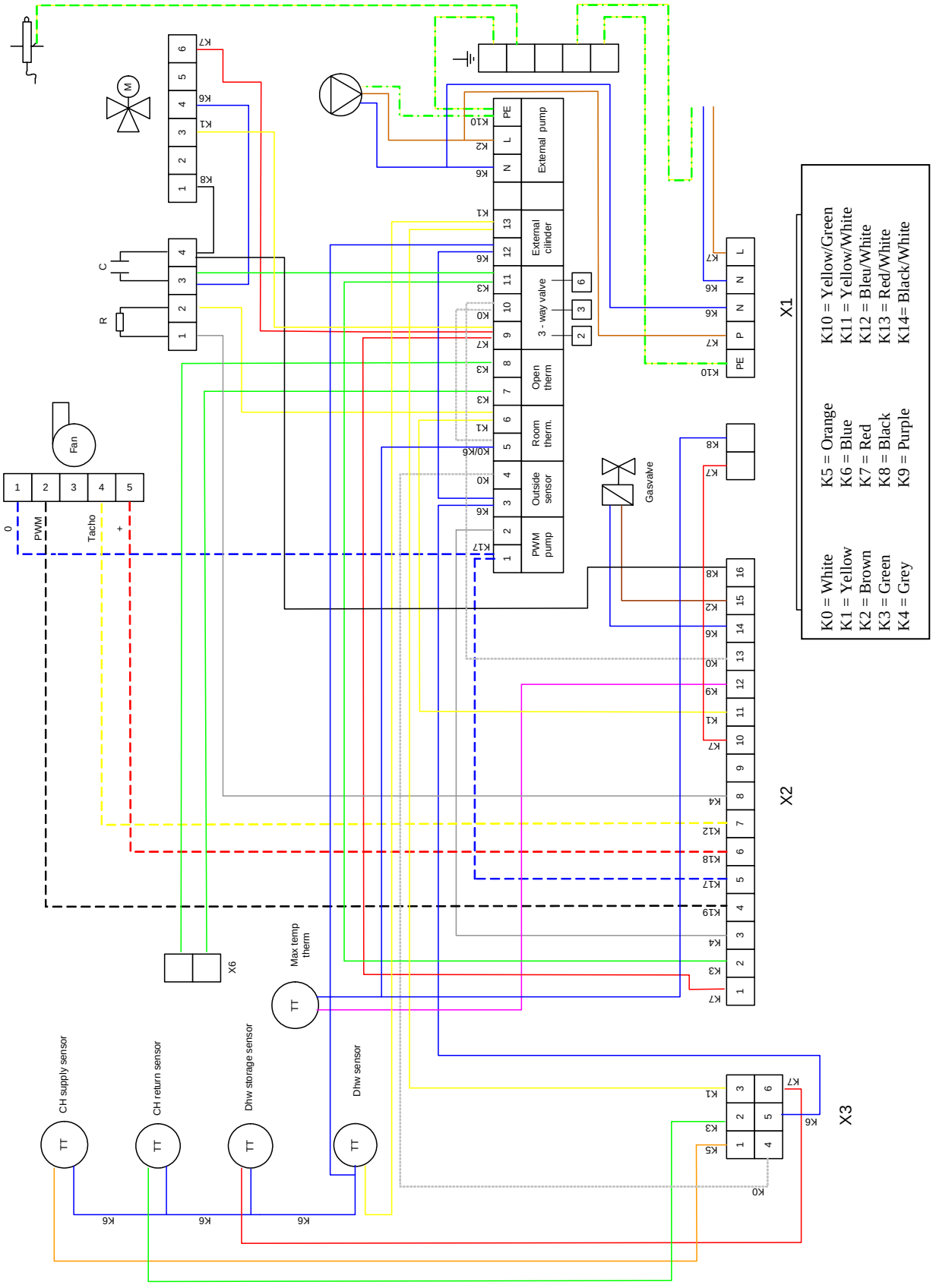
Take following actions to adjust boiler control-settings:

1. Do not connect or disconnect boiler from mains supply.
2. Disconnect plug of priority/heat maintenance sensor S3 (on DHW-spiral).
3. Connect electrical leads of external three-way valve to terminals 9,10 and 11.
4. Connect room thermostat or outside temperature sensor.
5. Connect cylinder sensor or thermostat to terminals 12 and 13.
6. Connect 240V mains supply; the display will show a "7" (for 1 minute) and a "5" (for 1 minute)= This is the start-up/ air venting programme
7. During the start-up programme the settings for the external cylinder control can be programmed into the burner control (see page 20) change programme No.1 boilertype to '3' (factory default = '0').
8. After the programming and start-up programme, the boiler will start it's normal operation. Disconnect the mains supply again.
9. On terminal "9" a yellow and 2 red cables (a thin and thicker one) are commonly connected. Disconnect these 3 leads, remove the 'thicker' red cable from the common joint. Connect only the 'thicker' red cable to terminal "9". The yellow and 'thin' red cables are no longer connected and must be electrically insulated.
10. Restore 240V mains supply. The boiler should now operate with the external cylinder.

Option:
Stopping DHW operation with an external switch (not for external cylinder).
The DHW operation for a combination boiler can be switched off (eg. Holiday cottage) by connecting an ON/OFF-switch to terminals 12 and 13. Switch On-position (closed contacts) will stop the DHW-operation.

N-L-PE 240VAC connection for an auxiliary external **pump.**
NB. If a modulating pump is used, the PWM signal cables must be connected to terminals 1 and 2.
NB. The pump will run also during DHW operation!!!

5.2 Wiring Diagram



COMMISSIONING

6.1 Control panel

6.1.1 Display

Consists of two digits on the left hand side and one digit on the right-hand side: **left hand side digits**: CH-flow water temperature of the boiler; **right hand side digit**: status of the boiler:

0	Stand by
1	Safety- or controlled shutdown*
2	Flame simulation or ionisation fault
3	Fan pre-purge
4	Ignition
5	CH demand or pump overrun CH
6	Domestic hot water demand
7	Heat up DHW-heat exchanger or pump overrun DHW

* A longer period of “Controlled shutdown” may indicate shutdown on outside air temperature. (Only if outside air control is fitted). Check temperature settings of outside temperature control (see par.6.3 Installer program)

6.1.2 Keypad Control

The keypad provides access to various options for setting and controlling the appliance; this always involves a combination of different buttons. The following combinations can be used:

1. Press “**Service**” and “**Reset**” simultaneously for 3 secs = Access to installation menu.

   After these buttons have been pressed, the Status window will show “**0**”, while a “**0**” will also appear in the temperature window. By means of the “**+**” and “**-**“ buttons in the **temperature display**, the code with the value “**8**” needs to be set. After this press the **service** button, to call up the various parameters.

   If the appliance is functioning, a “**-**“ sign will be shown first, until combustion ceases, after which the first parameter shows in the service window, and thereafter the various parameters can be called up and adjusted.

   Exit this installation menu by pressing the “**Reset**” button until the red LED above it goes out, this stores the adjusted parameters automatically; if this is not required, the service menu is exited automatically after a 1 minute delay, the amended data being stored.

2. Press “Service” and “+” simultaneously for 3 secs. = Gas valve adjustment position, (an “h” is shown in the display). See also par. 6.6 The fan speed is set to 3500rpm .The double display shows the number of revolutions divided by 100(e.g. 35 means 3500 rpm). Pressing “+” will set the boiler to maximum (6250 rpm), Pressing “-“ brings the boiler to minimum (2200 rpm).

Pressing “+” and “-“ keys simultaneously cancels setting the number of revolutions, and the appliance functions automatically.

3. Press “Service” and ”-“ simultaneously for 3 secs. (=blinking Fault 0 appears). In this situation, an amended software programme can be loaded or adjusted using a computer and the correct software programme. (Only for manufacturer)
4. If the “TAP” button is pressed, the following data are displayed depending on the situation:

   -if water is not being drawn off: the temperature of the DHW coil.

   -when water is being drawn off: the hot water temperature.

6.2 Sensors

The following temperature sensors are fitted in the boiler:

S1 = flow sensor (No. 66 page 44)

S2 = return sensor. (No. 67 page 44)

S3 = DHW storage sensor (No. 73 page 44)

S4= external outside temperature sensor (if fitted).

S5 = hot water (domestic) sensor (Combination boilers only) (No. 69 page 44)

The sensors used are of the NTC (negative temperature control) 10K type, except the outside temperature sensor, which is 12 K, and have the following characteristics:

Sensor table

Temperature [°C]	Resistance Sensor 1, 2, 3, and 5 10K[Ohm]	Temperature [°C]	Resistance Sensor 4 12K[Ohm]
0	32550	-30	171800
5	25340	-25	129800
10	19870	-20	98930
15	15700	-15	76020
20	12490	-10	58880
25	10000	-5	45950
30	8059	0	36130
35	6535	5	28600
40	5330	10	22800
45	4372	15	18300
50	3605	20	14770
55	2989	25	12000
60	2490	30	9804
65	2084	35	8054
70	1753	40	6652
75	1481	45	5522
80	1256		
85	1070		
90	915		
95	786		

In addition the appliance has a safety temperature limit thermostat; this is mounted on the square distribution pipe, on the right hand side of the stainless steel exchanger.

6.3 Installer's programme

If the installer's code is keyed in (after "Service" and "Reset" have been pressed for 3 secs.), the following parameters can be set and adjusted (adjusted with the "+" and "-" keys), by pressing the "service" button each time:

Programm enumber	**Name programme**	**Adjustable between**	**Factory setting**
*0	Installer code	0 – 99	Installer code is 8
*1	Boiler type	0 = CH + coaxial coil 3 = CH + boiler with own coil and external three-way valve	0
*2	Pump action	0 = pump overrun 1 = pump continue running	0
*3	Maximum CH capacity	19% and 99%	80%
*4	Maximum DHW capacity	19% and 99%	99%
*5	Minimum supply temp. for combustion line	10 … 25°C	20°C
*6	Minimum external temperature for combustion line	-30°C…10°C	-15°C
*7	Maximum external temperature for combustion line	15°C …30°C	20°C
*8	Pump overrun for CH function	1…15 min	3 min
*9	Pump overrun for HW function	0…90(0) sec.	6(0) sec = 1min.
*A	OpenTherm Cascade	0 …99 kW	24 kW
*C	Step modulation	0= step modulation CH is not active 1= step modulation CH is active; 5 minute steps 2= ditto, 10 min steps 3= ditto, 20 min steps	1
*d	Regulating Central Heating	0 = room thermostat with or without clock 1 = simple time clock	0
*E	Maximum supply temperature CH function	18°C – 85°C	85°C
*F	Boiler type	1: not to be used 2: Ethos 30/36 and 42/46 3: not to be used 4: not to be used	Type 2

Exit this programme, after the parameters have been adjusted, by pressing the “Reset” key until the Faults indicator light goes out.

Explanation of the set up options for the installer:

6.3.1 Programme number 1: Boiler type:

-For the normal combination boiler, key in the digit “0” here.

-If a boiler, with its own heating coil and an external three-way valve is used, programme in “3”.
With respect to the three-way valve, a Honeywell three-way valve, type VC 80-10 MF6004 needs to be connected to the terminal strip, while the valve must be fitted in the circuit in such a way, that the connection marked “B” is connected to the cylinder circuit, connection “A” therefore on the CH circuit, and on the “AB” connection on the CH boiler

6.3.2 Programme number 2: Pump action

Here it is possible to opt for the pump to over-run for the CH installation; this programming has no influence on the over-run of the pump after DHW draw off: this over-run time is established in parameter “9”.

For an over-run time for the CH installation, programme the digit “0”; the length of the over-run time is established under parameter “8”.

If continuous running is chosen (e.g. for under floor heating), “1” needs to be programmed.

6.3.3 Programme number 3: Max. CH capacity

This allows the maximum CH capacity (40/30 °C) according to the type plate, to be reduced, according to the accompanying table:

Table 4, CH capacity

	ETHOS 36	ETHOS 46
	kW	kW
100%	30	42.=
95%	28	40
90%	27	38
85%	25	36
80%	24	34
75%	22	31
70%	21	29
65%	19	27
60%	18	25
55%	16	23
50%	15	21
45%	13	19
40%	12	17
35%	10	15
30%	9	13
25%	7	10
20%	6	8

Combination boiler only

6.3.4 Programme number 4: Max. capacity DHW

The revolutions of the fan during DHW function are different from the revolutions during the CH function, as the maximum load during draw off is higher.
The table for the load during draw off is shown below:

Table 5, Hot water capacity

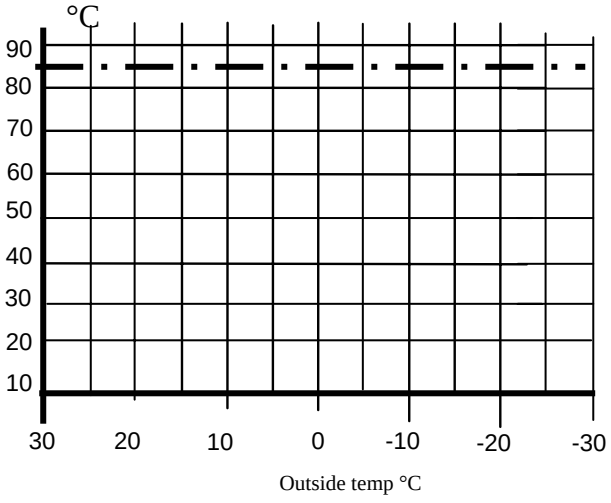
	ETHOS 36	ETHOS 46
	kW	kW
100%	36	46
95%	34	44
90%	32	42
85%	31	39
80%	29	36
75%	27	34
70%	25	32
65%	23	30
60%	22	28
55%	20	26
50%	18	23
45%	16	21
40%	14	19
35%	13	17
30%	11	14
25%	9	11
20%	7	9

6.3.5 Programme number E, 5, 6 and 7

Setting combustion line

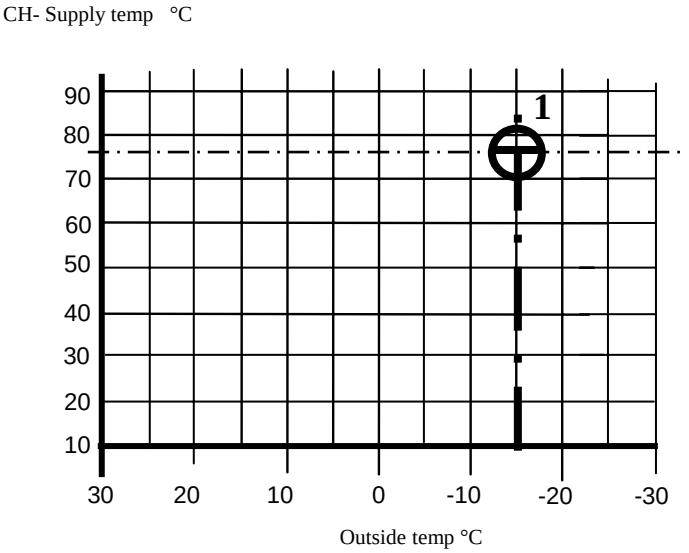
A combustion line is drawn between two points that are determined by **a specific outside temperature and the associated required supply temperature of the CH water. Instructions for determining this combustion line** are given in the steps below.

CH- Supply temp °C



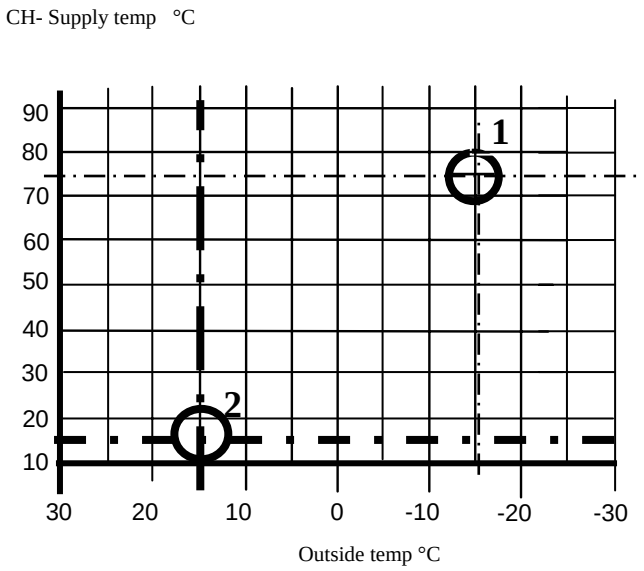
1st combustion line point at lowest outside temperature.

STEP 1. First of all the maximum supply temperature (design temperature transmission calculation) in the winter must be determined and set; with the help of **Programme number "E",** enter this temperature (temperature chosen can be between 18°C and 85°C). Choose e.g. 75°C.and fix it by pressing the "Service" key.



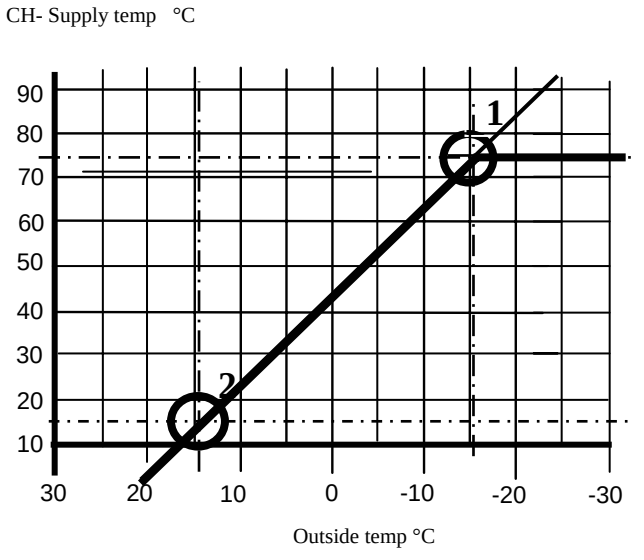
STEP 2. Now the associated outside temperature, by which this max. supply temperature is required, needs to be programmed in.
Press the “Service” key until it shows **Programme number 6**.
Enter the outside temperature here (e.g – 15°C, this is the temperature that is taken for the transmission calculation).
In this way the first point of the combustion line is established.

2nd combustion line point with a higher outside temperature.



STEP 3. Then the outside temperature at which no further heating is required needs to be set e.g.15 °C outside temperature.
Programme number 7 needs to be programmed with this value.

STEP 4. As the last step, the supply temperature needs to be set with the chosen outside temperature: this supply temperature then needs to be the same as the external temperature otherwise the appliance will not switch off.
For this **Programme number 5** needs to be programmed, e.g. 15°C.
For buildings that are very solidly built (e.g. castle walls), it will be necessary to allow the appliance to continue firing for longer period of time; in such cases 30°C can, for example, be chosen as the external temperature
This last programming step determines the second point of the combustion line, and a line is drawn automatically between these two points.
As the accompanying drawing shows, at point “1”, the combustion line will set an increasingly high feed temperature even at lower external temperatures, but the setting in Programme "E” prevents this: the temperature set is not exceeded.
At point “2”, the CH boiler will stop firing



6.3.6 Programme number 8: Pump over-run time for CH function

This sets the over-run time of the pump after the demand for central heating ceases.
3 minutes is programmed by default.

6.3.7 Programme number 9: Pump over-run time for DHW function

This sets the over-run time for the pump after DHW operation.
The setting can be between 0 and 900 seconds (15 minutes); the default is 60 seconds (1 minute): in the display the time is shown by omitting one 0.(e.g. display ‘6’ means 60 sec)

6.3.8 Programme A: Open Therm Cascade

If more than one boiler is used for the central heating, the cascade manager function of an Open Therm Control can be used to regulate these boilers (see the data from the suppliers of the Open Therm controls).
In this case the maximum central heating load of each appliance connected needs to be programmed in. Setting is possible from 0 to 99 kW. Default factory setting is 24kW.

6.3.9 Programme C: Step modulation

This parameter enables the supply temperature to be increased in steps early in the morning as the house is being warmed up, so that during this heating the appliance continues to condense and thus is highly efficient. There are 6 steps to this programme, with a programmable duration:
C 0 = no steps, thus on/off on the basis of the room thermostat
C 1= 6 steps each lasting 5 minutes (default factory setting)
C 2= 6 steps each lasting 10 minutes
C 3= 6 steps each lasting 20 minutes
At each step the capacity is increased by 20%, beginning with the minimum capacity.
The boiler therefore starts with the minimum capacity, and this capacity increases every “5, 10 or 20” minutes, by 20%, until the maximum capacity is reached, or this programme finishes, because the house has come up to temperature.

a. With an on/off room thermostat:
When there is no demand for heating, this programme counts back with the same time intervals until there is a new demand for heating: the appliance then starts up with the capacity appropriate to the time.
The efficiency of the boiler during the warming up period will always be greater than 100% and during the day will always have optimum output and avoid undesirable fluctuations in the temperature of the house.

b. With an “Open Therm” thermostat
When the room temperature reaches the set value, the step programme is abandoned, and the “Open Therm “ thermostat takes over the regulation of the boiler, and the capacity of the boiler is adapted to the need for heat: the boiler will modulate optimally and the room temperature will be kept very constant.

6.3.10 Programme d: CH Regulation

The controller is extremely flexible and will accept many types of external control. Almost all controls imaginable for the CH installation can be connected or activated and will be automatically detected by the automatic burner, there is however a difference between control on the basis of a simple time switch and a normal room thermostat: if a time switch is used it needs to be programmed in, under Programme d.

An overview of the options for connection and the operation of it for the central heating installation follows.

1. **Simple day/night time clock with a daily or a weekly programme, in association with the built-in outside temperature control and the outside temperature sensor.(so NO temperature sensor situated in a room)**

   *No room thermostat is used with this.
   * Each radiator must be fitted with a thermostatic control valve and a bypass must be incorporated in the installation.
   *Connect the time clock to terminals 5 and 6 of the terminal board in the boiler .
   *Connect the outside sensor to terminals 3 and 4 of the terminal board in the boiler.
   *If the time clock contact is closed (thus heat demand), the boiler supply temperature is going to assume a value according to compensation curve set (see page 21 for setting the combustion line,).
   * If the time clock contact is open (night reduction), an automatic night reduction of 2.5°C in the room temperature is achieved through a value programmed into the automatic burner; this can be adjusted only by means of a special programme (call Mikrofill Infodesk).
   *With the next heat demand (e.g. the early morning warming up) the combustion line will be increased by approximately 5°C for one hour (booster function), to bring the house up to temperature quickly; **the step programme does not need to be activated.**
   *Setting parameters: (**bold type**: need to be adjusted, the others remain unchanged (factory settings): 1-0; 2-0; 3-80; 4-99; 5,6,7 and E are the combustion line settings; 8-3; 9- **6**; A- **24** ;**C-0**; **d-1.**

2. **An on/off room thermostat (or clock thermostat), in conjunction with the built-in outside temperature control in the boiler and the outside temperature sensor.**
   *Connect room thermostat to terminals 5 and 6 of the terminal board in the boiler .
   *Connect the outside sensor to terminals 3 and 4 of the boiler terminal connection board.
   *With this type of control, the room thermostat acts as a "safety net": if it becomes too warm in the room in which the thermostat is situated, the thermostat opens and the boiler is switched off.:; if the room thermostat cuts in too often the compensation curve needs to be lowered.
   *The compensation curve set determines the supply temperature.
   * Night set back can be manually set by means of the room thermostat, or via the clock of a clock thermostat.
   *With the next demand for heat (e.g. the early morning warming up) the combustion line with be raised by approximately 5°C for one hour (Booster function), to bring the house up to temperature quickly; **the step programme does not need to be activated.**
   *Setting parameters: (**bold type**, need to be adjusted, the others can remain unchanged (factory settings): 1-0; 2-0; 3-80; 4-99; 5,6,7 and E are the combustion line settings; 8-3; 9-**6**; A- **24** ; **C-0**; d-0.

*If a separate time clock combined with an on/off room thermostat and the external temperature control is used instead of a clock thermostat, it needs to be programmed in accordance with **1.**

3. **An OpenTherm (clock) thermostat in conjunction with the built-in outside temperature control in the boiler and the outside temperature sensor.**
   *Connect the Open Therm thermostat to terminals 7 and 8 of the terminal board in the boiler .
   *Connect the outside sensor to terminals 3 and 4 of the terminal board in the boiler.
   *Except where adjustment is possible, no parameters need to be adjusted for the factory-set pre-programmed combustion line.
   *Setting parameters: (**bold type**, need to be adjusted, the others can remain unchanged (factory settings): 1-0; 2-0; 3-80; 4-99; 5,6,7 and E are the combustion line settings; 8-3; 9- **6**; A-**24**; C-2; d-0.

4. **Connect a room or clock thermostat to the boiler (Without outside temperature compensation)**
   *Connect the room thermostat to terminals 5 and 6 of the terminal board in the boiler .
   *Except for where adjustment is possible, no parameters need to be adjusted for the factory-set pre-programmed values.
   *Setting parameters: (**bold type**, need to be adjusted, the others can remain unchanged (factory settings): 1-0; 2-0; 3-80; 4-99; 8-3; 9- **6**; A- **24**; C-2;
   d-0; E-85

5. **Connect an Open Therm (clock)thermostat to the boiler (Without outside temperature compensation)**
   *Connect the Open Therm thermostat to terminals 7 and 8 of the terminal board in the boiler .
   *Except where adjustment is possible, no parameters need to be adjusted for the factory-set pre-programmed combustion line.
   *Setting parameters: (**bold type**, need to be adjusted, the others can remain unchanged (factory settings): 1-0; 2-0; 3-80; 4-99; 8-3; 9- **6**; A-**24**; C-2;
   d-0; E-85.

6.3.11 Programme E: Maximum CH-supply temp.

This sets the maximum central heating temperature of the boiler.

6.3.12 Programme F: Boiler type setting.

Do not adjust this setting. Setting should be boiler type ‘2’, which is the default factory setting.

6.4 Filling and venting the boiler and installation

Use the filling loop in the central heating installation to fill the boiler and the installation.

The fill pressure must be between 1 to 2 bar

To prevent corrosion of the central heating installation, pay attention to the following points:

a. The filling water: **do not add anything** to the CH water, while the pH value needs to be neutral approx 5 (if this is not the case you need to contact the supplier). Additives may only be used if Mikrofill gives a written approval.

b. Flush system thoroughly

c. If plastic pipes are used, they need to be guaranteed against oxygen diffusion in accordance with DIN 4726/4729; if this is not the case, a separation needs to be introduced between the boiler circuit and the circuit with the plastic piping.

d. Check for leaks in the circuit

Before starting the appliance for the first time the heat exchanger needs to be vented, once the installation and the boiler have been filled. Open the vent valve, found on the upper left hand side, a whole turn. As soon as water comes out of the vent cock, close the vent valve with the key.

The boiler is provided with an automatic air vent on the top of the CH pump, which needs to be open when the appliance is running; check that the cap is open at least one turn.

Check the fill pressure shortly after the appliance starts up, and if necessary add more water to maintain the required pressure. The electronic control of the wall-mounted boiler has a start-up programme, especially for venting the appliance. This programme is activated when the mains power is switched on for the first time and after the “Reset” button is pressed.

This start-up programme runs for 2 minutes: for the 1st minute display code “7” is shown for the 1st minute and code “5” for the 2nd.

Domestic Hot water circuit
The connections for domestic hot and cold water are on the underside of the appliance. Connect the pipes in accordance with the current regulations; fit an “inlet combination” in the cold water supply pipe; which can be combined with the overflow pipe, with the condensation waste pipe from the boiler.

The built-in DHW-flow limiter valve needs to be set, with the appliance working; measure the quantity of water at the furthest DHW outlet and set the valve according to Table 3, page 11. (Factory default = fully open**)**

Closing down
1. Isolate and disconnect the electrical system and turn off the gas tap.

2. If the appliance is switched off when there is a risk of frost, the CH boiler and installation need to be drained; to do this open the fill and drain taps of the CH installation and the boiler drain tap on the right hand underside of the appliance.

6.5 Initial Operation

6.5.1 General
The pressure in the gas pipe can be measured with the test nipple (3) on the gas regulator.

The minimum pre-pressure, which will allow the appliance to function correctly with the correct load, is 10 mbar.

6.5.2 Starting up the first time

When you have tested the installation and everything is in order, you can connect the electrical system.

When the appliance is connected to the mains supply, the double display will show the supply temperature and the single display the status of the appliance.

An automatic venting programme for the boiler lasting approximately 2 minutes follows the mains connection.

The ETHOS appliance has a built-in provision for hot water.

Set the room thermostat at a high value so that the burner needs to ignite.

In an appliance with provision for hot water, the hot water will be heated up first.

There is a four-fold electronic start, followed by a faults warning on the status display. Next press the RESET button for a return to the attempts to start.

To set the gas pressure, use screw [3].

6.6 Adjusting and setting load

To check the gas regulator or when attaching a new one, there are three methods for setting the correct load:

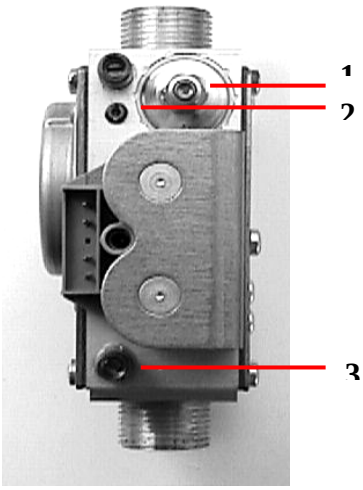
A. By measuring the percentage of CO_2

B. Check the gas consumption via the gas meter method.

Both the minimum and the maximum load need to be set using one of the methods: the maximum load needs to be set first, followed by the minimum load.

6.6.1 Setting the maximum load

Approximately a minute after ignition, press the keys marked “Service” and “+” simultaneously; the double display shows the revolutions in hundreds, while the single display shows *“h”* (CH). The number of revolutions of the fan can be increased or reduced by pressing the “+” key or the “-“ key.



To obtain the maximum load press the “+“ key The maximum fan speed will be automatically set (62 on display).

If the measurement lasts for more than 10 minutes the appliance will return to automatic operation; press the “Service” and “+” again to continue the measurement.

To return to the normal menu without having to wait for 10 minutes, press the “-“ and “+” keys simultaneously.

Turn the setting screw for the maximum load if necessary [2], for the following method of setting:

A. By measuring the percentage of CO_2; this needs to be in accordance with the table below.
B. Check via the gas meter method.

Table 6, Gas settings

		Type of gas	
		Nat. gas G 20	LPG(propane)
Injector:		none	none
Wobbe (W_i)	(MJ/m3)	45.7	76.64
Cal.value (H_i)	(MJ/m3)	34.0	88.00
CO_2 max. setting	(%)	8.8(+/-0.2)*	10.5(+/-0.3)*
CO_2 min. setting	(%)	8.4(+/-0.2)*	10.0(+/-0.3)*
			* measured without cover

B. Gas meter method
Measured with natural gas or propane according to the table below:

Table 7, Setting the maximum

Appliance	ETHOS 36	ETHOS 46
Natural gas	50 litres in 60sec.	50 litres in 44 sec.
LPG (propane)	15 litres in 46sec.	15 litres in 34 sec.

NB: For adjustment, the method under B is only **approximate:** measuring CO_2 % (method A) is the preferred method.

To measure emissions, the measuring point in the heat exchanger can be used by unscrewing the plastic cap.

WARNING !! When measuring do not put the probe more than 2 cm into the heat exchanger to avoid deviations in the result.

6.6.2 Setting the minimum load

After setting the maximum load, press the "-" key. The minimum fan speed will be automatically set. (22 on the display).

To set or adjust this minimum load, turn screw [1] for the minimum setting.

Note: Minimum setting is very sensitive; adjust screw with small steps.

The CO_2 % is reduced if the screw is turned anti-clockwise and increased when it is turned clockwise.

B. Gas meter method.

Minimum load according to the table below:

Table 8, Setting the minimum

Appliance	ETHOS 36	ETHOS 46
Natural gas	10 litres in 34 sec.	10 litres in 25 sec.
LPG (propane)	5 litres in 44 sec.	5 litres in 32 sec.

NB: values measured with a boiler water temperature of approximately 60°

Press the "-" and "+" keys simultaneously, which returns the appliance to automatic function; the set-up programme is interrupted in any case after 10 minutes and the appliance returns to automatic function.

6.7 Conversion to another type of gas

If the appliance is set up for LPG the following steps need to be taken.

a. The white plastic gas-air mixing chamber is situated on the side of the fan. This mixing chamber has one or two air inlet ports, at the front and in the case of a second opening, also at the back, depending on the type of boiler. These ports need to be closed for conversion to butane/propane.

Mikrofill can supply the correct stoppers on request:
ETHOS 36 one stop 15 mm
ETHOS 46 one stop 15 mm

b. Turn the screw [2] 4 whole turns (clockwise).

Reinstate the appliance; if the burner has not ignited after 4 attempts, turn the screw [2] one turn back (anti-clockwise).

c. If the burner has ignited: press the keys marked "Service" and "+" simultaneously for approximately a minute after the ignition

d. Display shows the revolutions in hundreds, while the single display shows ***"h"*** (CH). By then pressing the "+" key, or the "-" key, the number of revolutions of the fan can be increased or decreased.

e. For the maximum load press the “+“ key, the maximum number of revolutions is set (62 in the display).

f. After conversion, a label must be fitted on the boiler next to the data plate. The following labels are supplied by Mikrofill with the conversion set. “ set for gastype: 3P-G31-30mbar” and “ set for gastype: 3P-G31-50mbar”.

For setting the maximum and minimum burner load, follow the information under paragraphs Setting the maximum load and Setting the minimum load, with associated tables.

6.8 Hot water temperature

This is set by the manufacturer at 60°C to avoid danger from “Legionella” bacteria at lower temperatures.
This value **cannot** be adjusted.

6.9 Closing down

It is advisable to keep the appliance switched on winter and summer. This prevents the appliance freezing and moving parts seizing up due to corrosion.

Switch off the appliance by reducing the setting of the room thermostat: this will ensure minimum power consumption, as the CH pump and fan stop running after a short time.

If the appliance does need to be closed down, the following precautions need to be taken:

a. Close the gas valve
b. Disconnect mains electric
c. If there is a risk of frost drain the appliance and the installation.

To drain down the boiler, isolate the boiler from the heating system or drain the heating system. Attach a suitably sized hose to the drain valve on the boiler and open drain valve.

For the domestic water supply part, the inlet combination stopcock needs to be closed and a hot water tap opened.

7 FAULTS

In the unlikely event that the appliance develops a fault, it can be set to run again simply by pressing the “Reset” button.

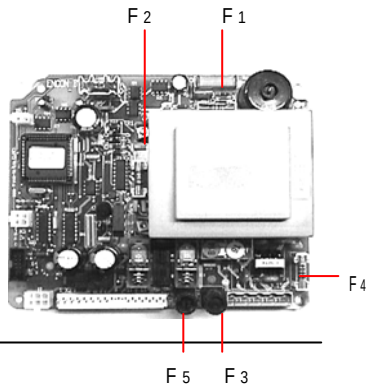
The following faults can occur, in which the digit below flashes in the single Status display and a code appears in the two digit display.

You will find the solution to the faults in Table 12 on page 34 and Table 13 on page 36

Table 9, Faults

Flashing faults text in the single display	Two digit display code:	Description of the fault:	Cause of the fault (See page 32)
No indication	None	Fault with electrical supply	14;50
No indication	None	Fan runs continuously	49
0	None	Maximum thermostat open	4;5;21;23;24;29;30,42,46
0	None	Glass fuse F5 defective	15
0	F1	Short circuit CH supply sensor (S1)	3; 41;42;43
0	F2	Short circuit CH return sensor (S2)	3;41;42;43
0	F5	Short circuit DHW sensor (S5)	3;41;42;43
0	1	No CH supply sensor (S1) detected	41;42;43
0	2	No CH return sensor (S2) detected	41;42;43
0	5	No DHW sensor (S5) detected	41;42;43
1	E1	Temp. CH supply sensor too high (S1)	4;5;23;29;46;28
1	E2	Temp. CH supply sensor too high (S2)	4;5;23;29;46
1	E3	Temp. priority sensor too high (S3)	24;45;46;51
1	E5	Temp. DHW sensor too high (S5)	24;45;46;51
2	5	CH Supply and return sensor exchanged	
2	21	CH supply temp. lower than return temperature, during running.	4;21;23;24;29;47
2	E	CH Supply and return temp. unequal during stand by	23;43
3	None	CH Supply temperature rises too quickly	4;5;21;24;28;29;46;51
4	None	No flame after 5 ignition attempts (boiler cycles on No.1,2,3,4)	10;11;16;18;22;25;35;48
6	None	Flame signal during stand by	18;35;61
7	None	Appliance is programmed	62
8,9,A	None	Fan revs incorrect	7;8;9;13;19;39;40;41
B	None	One or more parameters are incorrect	63
C	None	Gas valve or gas valve circuit is not correct	17;20;30;34;36;37
D	None	Check on gas valve reg. shows fault	17;20;30;34;37
E	None	Check on the mains voltage	64
F	None	Software fault; EMC external radiation	34
H	1 None	Reset button hanging or is defective; if the “H” does not flash: memory defective.	65

Fuse F 1: for ignition 100 mA;
Fuse F 2: for regulation 630 mA;
Fuse F 3: 35 VAC 3.15 A; for fan
Fuse F 4: 230 VAC 3.15 A; for mains voltage
Fuse F 5: 24 VAC 1 A, for three-way valve
All fuses are of type: Anti-surge



In addition there are also a number of faults that **cannot** be shown on the display.
A number of these faults or symptoms are shown below:

Table 10, Other faults

	Symptom	**Cause of fault** (see p32)
a	House does not reach temperature, appliance does fire	45;53;54
b	Ignition is loud	35
c	Boiler runs continuously but CH water does not warm up	45
d	Room thermostat demands heat, but boiler does not ignite	1;42;52
e	Boiler burning continuously, house too warm	2
f	Boiler very noisy when CH working	29;46;66
g	Radiators not hot enough at the top	55
h	Water drawn off but water from the hot tap remains cold	24;56
i	Hot water much too hot	51;57
j	Water is drawn off, but the water from the hot tap does not reach 60°C	51;58
k	Boiler very noisy during DHW operation	23;59
l	Fault after replacement of automatic burner control	60

7.1 Causes of faults

The following causes can account for the faults on pages 31/32.

Table 11, Causes of faults

1.	Room thermostat is incorrectly connected.	
2.	Room thermostat does not switch off, short circuit in the cable.	
3.	Sensor makes a short circuit in the cable or internally.	
4.	Pump does not run; stuck	
5.	Water pressure in the CH installation is too low.	
6.	Water pressure in the CH installation is too high.	
7.	Fan is not connected (forgotten to connect plug).	
8.	Fan is dirty.	
9.	Fan is defective.	
10.	Gas valve is not open.	
11.	Gas pressure is too low.	
12.	Incorrect gas pipe size	
13.	Fuse F3 defective	
14.	Fuse F4 defective.	
15.	Fuse F5 defective.	
16.	Gas valve setting at the minimum output is not correct.	
17.	Gas valve is not connected or incorrectly connected electronically.	
18.	Ignition cable not correctly connected.	
19.	Transformer defective.	
20.	Connection plug to gas valve incorrectly connected, or moisture in plug	
21.	Pump plug incorrectly connected.	
22.	Siphon blocked.	
23.	Air in system, bleed by opening and closing manual air vent valve.	
24.	Three-way valve is dirty.	
25.	Too much resistance in the air or flue system; blocked/dirty.	

27.	Air supply / terminal lets water in.	
28.	DHW flow control valve is dirty or wrongly adjusted; check bypass if applicable	
29.	Heat exchanger is blocked internally (insufficient circulation)	
30.	Limit thermostat defective (insufficient circulation)	
31.	Maximum load too high.	
34.	Automatic burner control unit defective.	
35.	Ignition electrode defective (porcelain cracked), distance between electrodes/burner	
36.	Moisture on the cables of the gas valve.	
37.	Moisture on printed circuit board of the automatic burner control unit.	
38.	Moisture in the pump wiring.	
39.	Moisture on fan and/or connection.	
40.	Fan plug connected incorrectly.	
41.	Plug incorrectly connected.	
42.	Connection cable damaged.	
43.	Sensor defective.	
44.	Flue gas leakage at back of the heat exchanger.	
45	Hot water drain tap leaking	
46	Pump speed is set too low	
47	Sensors interchanged (return sensor S2 and hot water sensor S5)	
48	Fuse F1	
49	Fuse F2	
50	Mains voltage 230 VAC	
51	Parameter(s) in the installers programme entered incorrectly	
52	Open Therm room thermostat, or normal thermostat incorrectly connected to terminal board	
53	Step programme in the installers menu not correctly programmed; or steps too long	
54	Clock programme of the clock thermostat needs to start earlier in the morning	
55	Supply and return pipe interchanged on the appliance	
56	Cable or plug to three-way valve incorrectly connected	
57	DHW storage sensor (S3) is incorrectly placed or is defective.	
58	The domestic hot water flow control valve needs to be adjusted (See Table 3,).	
59	DHW heat exchanger needs to be descaled	
60	Cable plugs on the printed circuit board incorrectly fitted	
61	Gas valve defective	
62	After programming with a computer, confirmation of new settings (blinking ‘7’)	
63	Incorrect parameters, or a value outside the scope of the programme, have been programmed	
64	The burner control unit carries out a frequent check on the supply voltage	
65	If flashing “H”: Mechanical defect off the Reset button. If a steady “H”: defect in the burner control unit	
66	Installer programme: programme no. “1” incorrectly set	

7.2 Table of solutions

Numbers correspond to Table 12

Table 12, Table of solutions

1.	Check cable or replace cable, check if it is connected to the correct terminal board.
2.	Replace room thermostat or replace cable: is the correct thermostat fitted.
3.	Replace sensor or trace fault in cable.
4.	Try to free the pump shaft or replace the driving part of the pump.
5.	Top up water and trace the leak, also check the expansion vessel for internal leaks.
6.	Too much topped up or check pressure of expansion vessel or replace expansion vessel.
7.	Insert plug: plug part with cables is on the side of the fan.
8.	Clean the blades of the fan.
9.	Replace the fan.
10.	Open the gas tap.
11.	Check the pipe and gas meter, if necessary calculate resistance.
12.	Replace gas pipe.
13.	Replace fuses; F3 fan check: moisture, short circuit, plug, wiring
14.	Replace fuses; F4 check all 230 V connections: pump, circuit board connection
15.	Replace fuses; F5 check the connection, the plug and the motor for the three-way valve
16.	See paragraph 6.6.2
17.	Check the cabling using the wiring diagram, check the connection to the gas valve, check for moisture.
18.	Check cable for short circuit, overheating close by or pinched between steel plate; check the spark plug cap for cracks, replace the cap.
19.	Replace the burner control unit.
20.	Moisture inclusion, check on the cable sockets which need to be plugged in correctly to the electric plug, check the position of the cable sockets, possibly straighten, before the plug is put in.
21.	Check whether the plug(s) fit(s) correctly in each other, with the correct press-on force.
22.	Open the flush pipe (left side of the appliance), by unscrewing the cap: hold a jar under it, to catch the water that runs out. Poke out this pipe with a thin rod, to both upper left and upper right. If necessary remove the burner unit from the appliance, and pour water into the heat exchanger to rinse out the siphon.
23.	Venting, not simply the boiler but the whole installation – with this complete venting, the 230 V plug of the appliance can be removed from the socket, as the CH pump should not operate during bleeding.
24.	Inspect the shut-off valve of the three-way valve, by removing the pump motor by unscrewing the four fixing screws; the valve can be inspected on the inside of the housing. The drive motor can be removed, by removing the fixing screw on the front of the housing (below right), and then pressing in the “snap” lip, situated on the side of the housing, just above the motor, and at the same time pushing the motor downwards.
25.	Check the air and flue-ducts for blockages.
26.	Check the air and flue system.
27.	See 26.
28.	Take off the cold water connection from the appliance and remove and clean the domestic hot water flow control valve.

29.	It is advisable to remove the automatic burner from the appliance first, to avoid water damage to the printed circuit board. After the appliance has been drained, the coupling of the T-piece in the supply pipe, and the flat coupling of the return should be loosened near the pump. Detach the earth and the spark plug cables, and the wires of the maximum thermostat (above right). After this detach the three tension bars, push the heat exchanger partially forward, and detach the electrical plug on the fan; then remove the exchanger from the appliance.
30.	Replace the maximum thermostat by unscrewing it from the brass nut: the system does not need to be drained (do not remove the brass nut).
31.	Follow the setting up procedure in paragraph 6.6.1
34.	Remove the burner control with housing from the appliance by: a. Removing the lid b. Remove the wiring on the printed circuit board –1 x 2 pin connector (back of printed circuit, with green wires), 1 x 8 pin connector (front left), 2 x 16 pin connector, and the 230V plug (right hand side). Remove two screws on the underside securing the housing. The housing including the burner control can be removed from the appliance. Next remove the small display cable from the printed circuit board, push the automatic burner out of the housing and replace it.
35.	Replace or bend electrode. Warning: bend close to the burner plate, otherwise it could break.
36.	Dry off, possibly blow dry with warm air (hairdryer) and check that it functions correctly, Replace if necessary.
37.	See 36.
38.	See 36. Remove the connection and dry it; possibly by blowing or blow dry with a hairdryer.
39.	See 36. Remove the connection and dry it; possibly by blowing or blow dry with a hairdryer.
40.	Plug wire connection needs to point to the exterior of the fan and to drop with one side in the slot of the printed circuit board.
41.	Check the plugs and push them into each other correctly.
42.	Check cables for possible damage or kinking and replace if necessary.
43.	Check pipe connections, replace sensor.
44.	Check the connection of the heat exchanger on the flue gas box, if necessary re-fit, fit new lip ring.
45	Check all draw-off points, and possibly DHW pipes for leaks.
46	Set the switch for the pump to position 3.
47	There is a sticker on the pipe indicating the colour of the sensor cabling.
48	Possibly replace the fuse (must be a reason for the defect); there is no spare fuse, see diagram on p.31
49	Possibly replace the fuse (must be a reason for the defect); there is no spare fuse, see diagram on p.31
50	Check the mains cable, the wall socket box for voltage; main fuse.
51	Check the programmed parameters on p. 19
52	Check the type of room thermostat, and the sticker with the indication on the terminal connection board on the appliance.
53	Adjust the step programme, see pp. 19 and 23
54	Introduce an adjustment in the times for “rising”, in the clock thermostat.

55	CH-Supply (water leaving) is on the left hand side of the appliance; CH return on the right.
56	Push the 4-core cable with mini plug into the three-way valve motor; check the three cables (2 x red and 1 x yellow) in the terminal connection board gate 9, on the cover, remove and re-fit.
57	Check the correct fitting of. DHW storage Sensor S3
58	Set with an Allen key of the correct size (8 mm).
59	The appliance needs to be drained on both the CH side and the DHW side. The spiral can be taken out of the appliance if the flat couplings of the two T pieces on each side of the spiral are removed Remove the fixing bracket on the underside of the spiral. The space between the inner and outer tubes is rinsed with water from the domestic system and may be furred up or dirty; this part needs to be cleaned/flushed.
60	It is possible that one pin has been shifted too far in the 18-pin printed circuit board connector so that the wiring does not connect with the correct pins: check both the left and right hand sides of the printed circuit board to ascertain whether or not the connector(s) is/are correctly fitted.
61	There are usually two reasons for a defective gas regulator: the electric coils are defective or there is an internal fault in the gas valve; in either case it is advisable to replace the whole gas valve.
62	If the boiler control is adjusted using the “service software” and the adjusted parameters are programmed, this is the confirmation that the boiler control has accepted the new parameters.
63	The correct software (please check this) must be used for programming, at the same time the threshold values must not be exceeded; try to programme again.
64	The supply voltage needs to be checked with a universal meter; if the supply voltage is correct (it needs to be between 190 and 250 Volt) the burner control needs to be replaced.
65	In order to repair the Reset button, the display can be removed from the plastic spacers and can once again be checked for correct functioning: if negative, the display needs to be replaced; if the display functions outside the appliance, you need to check whether the button has sufficient space under the plastic cover (is it jammed?); loosen it. If the “H” does not flash the automatic burner needs to be replaced.
66	Check parameter setting: Programme No. 1 needs to be set to value ‘0’

8

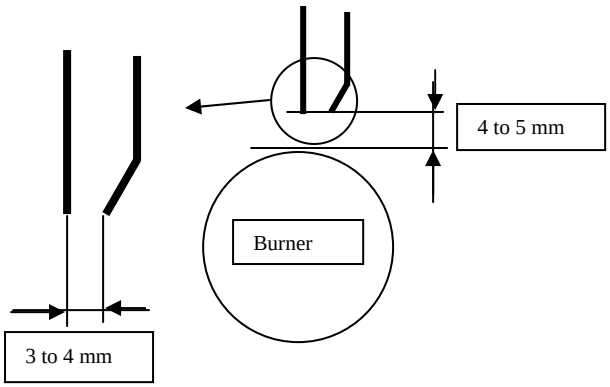
MAINTENANCE

General maintenance / inspection needs at least every 18 months or sooner if the appliance is not working correctly or the boiler control generates the same fault codes a number of times.

Inspection:

The following operations need to be carried out for inspection.

a. Ask the user about possible problems with the CH appliance and/or any other problems.
b. Check the installation (water) pressure; needs to be between 1 and 2 bar.
c. Remove the cover of the appliance and inspect all pipes and connections for traces of water and/or water leaks.
d. Inspect the upper side of the cover and upper side of the appliance for signs of water or leaks from the air inlet pipe or the vender.
e. Open the siphon, and remove any dirt.
f. If a laptop is available, connect it and check the service page about the reports of faults, starts and failed/successful attempts at starting.
g. Set the appliance to maximum combustion and measure the load and CO_2 % when operating.
h. Set the appliance to minimum combustion and measure the load and CO_2 % when operating.
i. Note the noise of the CH pump and the fan.
j. For an ETHOS boiler, measure the quantity of hot water and the hot water temperature with the hot water tap fully opened.
k. While the hot water is warming up, check that the supply to the CH installation does not become warm.
l. Dismantle the burner unit by removing the 6 M6 nuts, disconnecting the ignition cable and pulling the burner unit forward.
   If the burner is pulled halfway along the furnace, the plug needs to be removed from the fan cable.
   Check the inside of the heat exchanger.
m. Dismantle the plastic air inlet box on the inlet side of the fan, inspect the fan blades.
n. Check the distance between the electrode and burner; this gap needs to be 4 to 5 mm.



Maintenance:
Depending on the result of the inspection, the maintenance should be preventative as far as possible.

The reason for this is:

re a. The comments and remarks of the client need to be taken seriously and the causes need to be found for any faults and problems.
re b. Pressure of the installation needs to be brought up to between 1 and 2 bar: any leaks in the installation need to be traced; possibly rectified by installer or service department.
re c. Any leaks need to be rectified.
re d. If water is leaking from the air inlet pipe the cause must be traced; it may be in the roof or in a concentric pipe, through leakage from the flue gas exhaust pipe.
re e. If the condensation water from the siphon is very dirty this needs to be rinsed out; there are a number of options for this :
1. If the burner has already been removed, fill the water pipe in the heat exchanger, which will reach the siphon automatically.
2. Push the supply pipe up (if possible) so that water can be added to the supply of the appliance.

re f. Select conclusion from the service screen and note the parts that are the cause of these faults using the service programme and a laptop.
re g. If necessary adjust the maximum gas setting
re h. If necessary adjust the minimum gas setting
re i. If the CH pump is noisy, and especially if it is more than 5 years old, replacement of the pump motor is recommended as a precaution.
re j. With a hot water quantity less than the value in Table 3 (page 11), the water flow regulator needs to be checked for dirt. If this is clean, and the hot water quantity shows a value less than Table 3 (page 11), the heat exchanger for the hot water needs to be de-scaled or replaced, as it is 99% likely that lime scale deposited in the domestic exchanger is the cause.
re k. If the supply water increases in temperature during draw off, it means that the three-way valve is dirty on the inside and this needs to be cleaned or replaced.
re l. The burner itself must never be cleaned. If the heat exchanger is dirty on the inside and/or there are deposits on the inside from the stainless steel pipe, this needs to be removed with citric acid or a stiff brush (do not use a wire brush**!**).
Then remove the dust with a vacuum cleaner.
re m. If the blades of the fan have deposits of dirt, each blade needs to be cleaned carefully until the material of the blade is visible. If this is not done evenly the fan will not run evenly and an imbalance will occur.
re n. Carefully adjust the electrode, without touching the burner, until the correct gap is achieved. (see page 37)

9 INSTRUCTIONS TO THE USER

Instruct the user how to operate the whole installation. In particular make sure the user is familiar with the safety provisions.

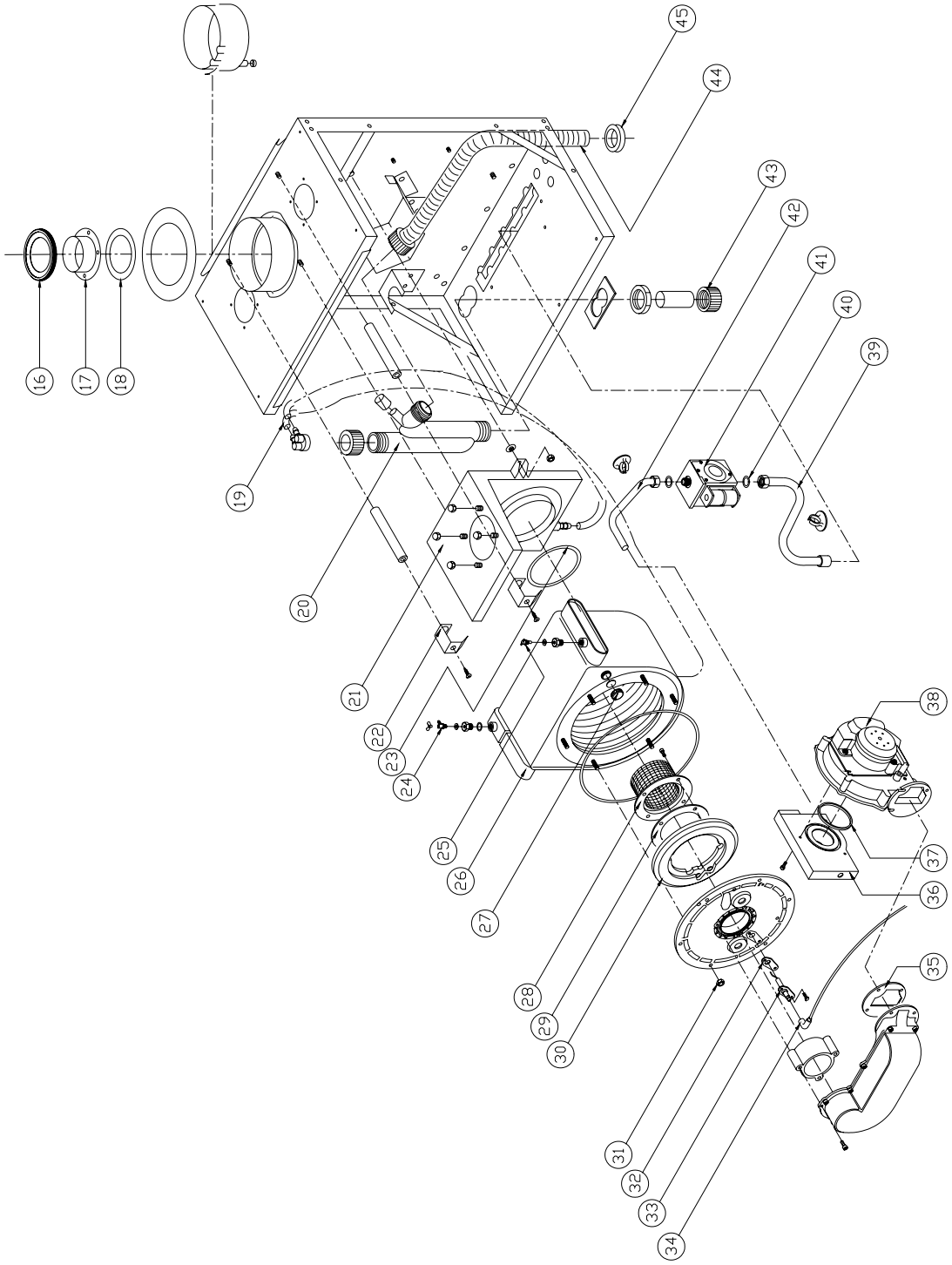
Advise the user that the boiler needs to undergo inspection and maintenance every 12-18 months.

Regular servicing is needed for the boiler to function safely.

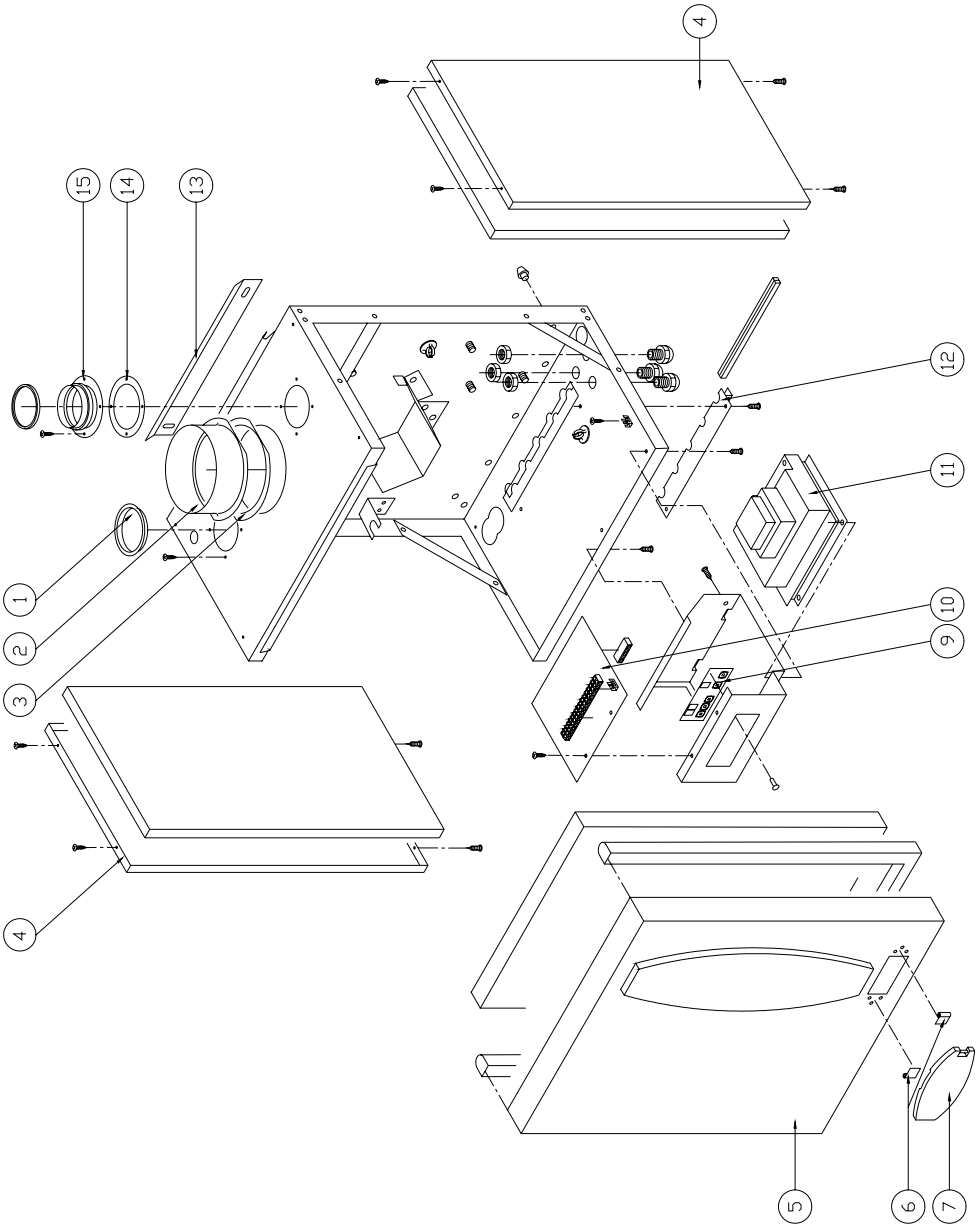
Hand over the paperwork supplied with the boiler to the user.

10 EXPLODED VIEW DRAWING

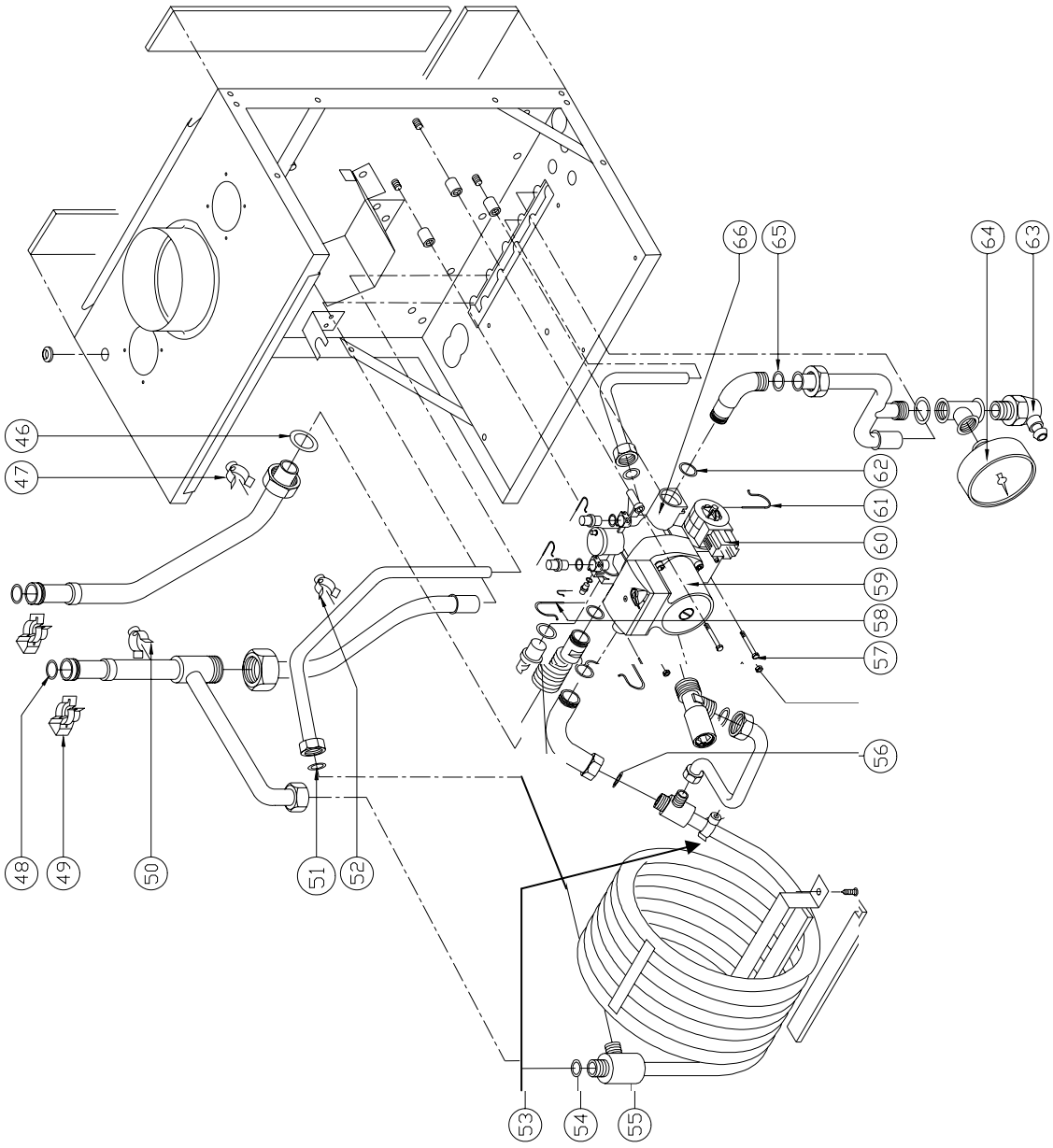
10.1 Burner+fan+gas pipe



10.2 Casing + electronics



10.3 Pipes + pump+ DHW coil



11

LIST OF SPARE PARTS

Pos .	Name	Part No.
1	Cover air inlet 80 mm	106-0059
2	Air inlet pipe set 125 mm	106-0274
3	Packing pipe 125 mm	In set 2
4	Side panel + insulation	106-0103
5	Front panel + Display door + insulation	106-0271
6	2x Hinge+ Display door	106-0273
7	Display door	See 6
9	Display + Flat cable	106-0088
10	Cover with cable harness complete	106-0272
11	Boiler control	106-0101
12	Pipe bracket	NA
13	Mounting bracket	106-0085
14	Packing air inlet 80 mm	106-0064
15	Air inlet connector, 80 mm	106-0058
16	Seal 125 mm to 80 mm	106-0116
17	Flue gas connector	106-0082
18	Sealing flue gas outlet	106-0081
19	Siphon inlet with hose	see 20
20	Siphon complete	106-0119
21	Flue gas collecting chamber	106-0083
22	Mounting bracket heat exchanger	106-0056
23	Lip ring flue gas chamber	106-0076
24	Bleeder 1/8”	106-0125
25	Limit thermostat	106-0089
26	Heat exchanger Ethos 36	106-0071
	Heat exchanger Ethos 46	106-0073
27	Cap test point + packing	106-0060
28	Burner bar 36 ETHOS	106-0168
28	Burner bar 46 ETHOS	106-0170
29	burner gasket	106-0117
30	Insulation burner door	106-0078
31	Nut M6 burner door	106-0079
32	Spark plug gasket	106-0080
33	Spark plug 36 and 46	106-0052
34	Spark plug cover	106-0090
35	Packing gas/air channel ETHOS 46 and 36 (after 03.2004)	106-0068
35	Packing gas/air channel ETHOS 36 (grey version , before 03.2004)	106-0066
36	Gas/air mix chamber 36	106-0108
36	Gas/air mix chamber 46	106-0110
37	“O” ring mixing chamber	106-0131
38	Fan	106-0091
39	Gas pipe lower	106-0153
40	Gasket gas pipe (NBR)	106-0156
41	Gas valve Dungs	106-0097
42	Gas pipe upper Ethos 36	106-0154
	Gas pipe upper Ethos 46	106-0155

43	Strainer siphon, with seal	see 20
44	Flex hose siphon outlet	see 20
45	Entry socket 25 mm	106-0150
46	Flat gasket ¾”	106-0158
47	CH Return sensor 18 mm	106-0096
48	“O” ring 17,8x2,6	106-0136
49	spring clip	106-0134
50	CH supply sensor 18 mm	see 47
51	Flat gasket ½” mm	106-0159
52	DHW sensor 15 mm	106-0098
53	DHW storage sensor	See 47
54	Flat gasket ¾”	See 46
55	DHW heat exchanger	106-0139
56	Flat gasket ¾”	See 46
57	Pump attachment bolt	106-0115
58	Pump spring10 mm	106-0146
60	Three way valve motor	106-0152
61	Pump spring 18 mm	106-0147
62	“O” ring pump 17x4 mm	106-0138
63	Drain tap	106-0126
64	Pressure gauge	106-0087
65	Flat gasket ¾”	See 46
66	CH pump complete	106-0091

12 GUARANTEE

The Mikrofill guarantee covers only the failure of the boiler due to defective components. The guarantee does not cover faulty installation or failure to follow installation instructions including incorrect siting.

Each component is guaranteed against defect for a period of 2 years from purchase.

The stainless steel heat exchanger is guaranteed against defect* for a period of 10 years from purchase

*** leakage/corrosion**

Declaration of conformity
in accordance with the EC DIRECTIVES relating to machines
(89/392/EEC, 91/386/EEC, 93/68/EEC)
and the EC DIRECTIVES relating to EMC
(89/336/EEC, 91/263/EEC, 92/31/EEC,93/68/EEC)

Mikrofill
Hereby declares, that its Central Heating Boilers:

Name: Mikrofill
Type : ETHOS

have been manufactured in accordance with the stipulations of the
EC DIRECTIVES relating to machines and the EC DIRECTIVES relating to EMC.

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