

Ultramax WM Wall Mounted Condensing Boiler

<u>Operating & Maintenance Manual</u> For Models 45, 65, 85, 100 & 120



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WM Technical data

Туре			WM/45	WM/65	WM/85	WM/100	WM/120
Nominal heat output ((80/60 ⁰ C)	kW	5.6-39.2	8.3-59.2	15.6-77.8	17.6-88.2	21.9-109.8
Nominal heat output ((40/30°C)	kW	6.3-43.0	9.2-65.0	17.0-85.0	19.2-96.3	24.0-120.0
Heat input, gcv ((Hs)	kW	6.4-44.4	9.5-67.4	17.7-88.8	19.9-99.9	25.0-124.8
Heat input, nev	(Hi)	kW	5.8-40.0	8.6-60.7	16.0-80.0	18.0-90.0	22.5-112.4
Gas Nature Consumption (10.9	ural gas H 9 kWh/m³)	m3/h	0.5-3.7	0.8-5.6	1.5-7.3	1.7-8.3	2.1-10.3
P1 (12.	ropane 8 kWh/kg)	kg/h	0.5-3.1	0.7-4.7	1.3-6.3	1.4-7.0	1.8-8.8
Gas inlet Nat pressure (mi	tural gas n./max.)	mbar	17/20	17/20	17/20	17/20	17/20
Pi (mi	ropane n./max.)	mbar	30/50	30/50	30/50	30/50	30/50
Maximum water temp central	erature of	°C	90	90	90	90	90
heating system	n						
Maximum operating	pressure	bar	6	6	6	6	6
Water conten	t	litre	5.1	6.6	8.4	10.3	12.0
Water resistance (ΔT	′=20°C)	kPa	14	20	25	28	30
Excess head of the both $(\Delta T=20^{\circ}C)$	iler pump	kPa	26	29	15	24	12
Connection for flue outlet	D	mm	80	80	100	100	100
Connection for air inlet	D1	mm	80	80	100	100	100
Gas connection	G		R3⁄4"	R3⁄4"	R3⁄4"	R3⁄4"	R3⁄4"
Water connection	W (int)		Rp1"	Rp1"	Rp1"	Rp1"	Rp1"
	W (ext)		R11⁄4"	R11⁄4"	R11⁄4"	R11⁄4"	R11⁄4"
Condensate drain (Øouter)		mm	25	25	25	25	25
Electrical supply		V	240	240	240	240	240
Frequency		Hz	50	50	50	50	50
Fuse protection		А	6	6	6	6	6
Maximum power consumption	(excl. pump)	W	97	98	123	130	215
Maximum power consumption	(incl. pump)	W	190	230	255	325	410
Insulation			IPX4D	IPX4D	IPX4D	IPX4D	IPX4D
Boiler weight, empty, $\pm 5\%$		kg	45	55	65	80	90

Table 1

WM Dimensions



Т	ype	WM/45 WM/65		WM/85	WM/100	WM/120
B1	mm	120	120	140	140	140
D	mm	80	80	100	100	100
D1	mm	80	80	100	100	100
G		R 3⁄4"				
L	mm	340	405	510	560	670
L1	mm	74	90	90	90	90
W		R 11/4"/Rp 1"				

Table 2

(We reserve the right to make changes without prior notification) The data may deviate slightly due to fabrication tolerances.

Conditions applicable to table 1:

- Gas consumption at: 1013 mbar, 15°C, dry.
- Gas category: 22H3P
- Category of appliance: B23, C13, C33, C43, C53, C63, C83

Service Clearances (Minimum)

Front	Above	Below	Left-hand Side	Right-hand Side
1000mm	400mm	250mm	100mm	100mm

1 Introduction

1.1 General

Through their unique construction, the WM range of central heating units are renowned for their:

- High thermal output
- Environmental-friendliness (they meet the most stringent environmental conditions)
- Low weight and compact size
- Durability
- Low noise level
- Broad control range
- Can be supplied in a wide range of models

Through active and market oriented research, MHS Boilers Ltd is in a position to offer solutions for the most challenging heating requirements.

1.2 The supplier

MHS Boilers Ltd are proud to supply and technically support the Ultramax WM Range of boilers throughout the United Kingdom.

For advice or more information please contact your local sales representative or our head office via 01268 546700. or via our website www.mhsboilers.com

1.3 This document

The present documentation has been prepared with the following target groups in mind:

- The technical consultant
- The installer
- The maintenance technician
- The user

MHS Boilers Ltd has opted to make the technical documentation as comprehensive as possible in the form of this book, in order to ensure that these target groups have all the information they need. As the supplier we would be happy to help you in connection with any additional information that you may require.

This document covers the following aspects relating to the boilers:

- General description
- Technical specifications
- Requirements for design and installation
- Maintenance instructions

The operating instructions for the user have been affixed to the appliance itself. You will also find them in chapter six.

1.4 Service

For commissioning and assistance in maintenance matters, please contact the Technical Services Department via 01268 546700.

1.5 General restrictions

MHS Boilers Ltd products should always be used, installed and maintained in accordance with the statutory requirements, specifications and standards applicable to these installations.

All the data, information and suggestions concerning its products provided by MHS Boilers Ltd are based on careful study.

However, the use, installation and operation of the same are outside the control of MHS Boilers Ltd and neither MHS Boilers Ltd nor any other organisations associated with it, accept any liability for the same.

Changes may be incorporated without prior notice. MHS Boilers Ltd accepts no obligation to adapt previously delivered products to incorporate such changes.

2 Description

2.1 General

All WM wall mounted boilers are environmentally friendly gas fired heating boilers with a modulation range between approximately 20% and 100% of their maximum output.

The WM series consists of 5 models of boiler with an output range of 45 to 120 kW. The appliances have low NO_x and CO emission, which satisfy the most stringent environmental requirements.

The WM series has received CE Approval for all relevant European countries and has been registered under the Product Identification Number 0063BO3192.

The boilers may be used on both open (category B23) as well as room sealed (category C13, C33, C43, C53, C63 or C83) systems.

As standard, the boiler is delivered fully wired, fully assembled, and tested.

Working principle and design

Air is drawn in as required, via a speed controlled fan. The zero pressure controller of the gas valve measures the under pressure in the venturi and modulates the gas in response to this pressure from the fan. The gas/air is then thoroughly mixed in the correct ratio and passed directly into the burner.

A temperature controller compares the actual water flow temperature to the desired water temperature.

The controller interprets the load required and adjusts the fan speed. The fan sends a speed feed-back signal, and the controller re-adjusts the speed as required.

The mixture of gas and air that is formed is then conveyed through the cylindrical stainless steel burner for combustion.

The heat exchange takes place in a double heat exchanger block. The first heat exchanger is located immediately next to the burner, while the second heat exchanger is connected downstream

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(condenser). Both heat exchangers consist of several smooth pipes in the form of a coil. The two heat exchangers are connected to each other using water distribution manifolds. The water is circulated by the boiler pump. This pump will be in the boiler for types 45, 65 and 85 and external for the types 100 and 120 (supplied by the installer).

The WM boiler has a low water capacity. Due to this, rapid changes of the water temperature can be achieved. It can be used without any return temperature protection. The installed pump provides the water flow rate required. This pump has three-stage modulation (types 45, 65 and 85).

Application possibilities

The design of the WM boiler makes it suitable for use in heating systems with:

- constant flow temperature;

- weather dependent set point adjustment; Only in combination with an optional outside air sensor and BM8 room unit.

- low temperature condensing system;
- external temperature control via building optimiser

(0 - 5 Vdc = -10°C + 90°C, below 1Vdc the boiler reverts back to the set temperature (P1), see

5.3.2 'connecting terminals')





2.2 Main components	
1 Flue outlet connection	12 On/off switch
2 Air inlet connection	13 Condensate drain
3 Gas connection	14 Frame
4 Flow connection	15 Burner/ heat exchanger package
5 Automatic air vent	16 Water flow temperature sensor
6 Casing	17 Gas valve
7 Return connection	18 Venturi
8 Flue gas temperature sensor	19 Air intake silencer (types 45, 65 and 85)
9 Fan	20 Boiler pump (types 100 & 120 External)
10 Pressure Gauge	21 Control panel
11 Automatic boiler controller	

2.2.1 Case Removal (Models produced post 01/01/07)

To remove the case panels use a flat bladed screwdriver to loosen the two brass screws located at the base of the front sliding panel. With the screws hanging from the base of the front panel slide the front panel up and disengage it from the unit.

The side panels are secured via toggle clips located on the top of the unit and location pins at the base. The inner front panel is secured via an expansion toggle located at the top of the panel.



2.2.2 Description of principal components

Fan [9]

The fan pulls in and compresses the combustion air, drawn from inside the casing of the boiler. The fan is a DC current fan equipped with a speed feed-back signal. This speed feed-back signal is transmitted back to the controller, which makes the necessary corrections.

Gas train

The main component of the gas train is the gas valve [17]. The gas quantity is controlled according to the quantity of air. The air quantity varies with the speed of the fan. The gas train is equipped with a test point through which the gas pipe can be vented or the gas inlet pressure can be measured.

Burner/heat exchanger package [15]

After the gas/air mixture has been correctly mixed, it flows into the burner via the inlet channel. Due to the overpressure, the gas/air mixture is forced through the burner to the external surface of the burner for combustion.

The heat exchanger is made of smooth stainless steel tubes in the form of coils. It essentially consists of two parts; one part is located immediately next to the flame, where the major portion of the heat transfer between the combustion gases and the water takes place. The other part functions as a condenser for the flue gases, where the transfer of latent heat takes place. Stainless steel water distribution manifolds ensure optimum water flow through the heat exchanger.

Water connections

These consist of a flow connection [4] and a return connection [7]. There is a water temperature sensor [16] on the flow connection which, apart from controlling the burner load, also monitors the water flow in the boiler. The latter is done in combination with the flue gas temperature sensor [8].

Boiler pump [20]

The boiler pump of the types 45, 65 and 85 is located in the return connection of the boiler and is electrically connected directly to the corresponding terminals in the control panel. The boiler pump of the types 100 and 120 will be supplied by the installer and can be directly connected to the return connection of the boiler. (Max 1 Amp) The capacity and the head of the pump is adequate to overcome not only the boiler resistance but also some system resistance (see table 1). In the types 45 - 85, the pumps have three-stage modulation, depending on the load.

Condensate drain [13]

The boiler is equipped with a bottle trap. This bottle trap is located on the bottom side of the appliance and should be easily filled with water prior to operation of the unit.

Frame [14]

The frame is the load bearing part of the boiler. All the components are installed on it.

Casing [6]

The casing can be removed easily in 3 units. To do this, refer to the section 2.2.1.

Electrical equipment

This comprises of the control system and safety devices of the boiler. The connection terminals are installed in a fully sealed enclosure behind the control panel [21]. This panel can be tilted through 90° after removing the control panel bolt. This provides access to all the electrical connections, without the need to remove the casing. Slide the front case up to reveal the boiler control panel.

2.3 Boiler control

If heat is required, the boiler will start, if all necessary conditions have been fulfilled and no safety devices have been triggered. This heat requirement will arise if:

- The flow temperature of the boiler is less than the required flow temperature
- The manual option has been selected using selector switch set to: 🎄 I or 🎄 I
- The frost protection has been triggered independently of the operating conditions ($^{(1)}, ^{(2)}, ^{(3)}, ^{(3)}$

åI or å∏

The integrated temperature controller adjusts the heat input inside the boiler by changing the fan speed so that the desired temperature is reached and kept at a constant level. Depending on the quantity of air displaced by the fan, a specific quantity of gas will be added. As a result, the boiler capacity can be modulated seamlessly and the heat requirement can be accurately monitored. If the flow temperature rises above the desired level together with any hysteresis, the boiler will switch off. The boiler will start again as soon as the flow temperature falls below the desired level.

2.4 Safety aspects

The following safety devices are installed on the boiler:

- Temperature monitoring system
- High limit temperature monitoring system (STW)
- Limit temperature monitoring system (STB) (both are adjustable)

- Frost protection system. Using an external sensor, if the external temperature falls below 0°C. Based on the flow temperature, if this is below 5°C and/or the domestic hot water temperature is below 10°C

- Flame monitoring by means of ionisation measurement
- Fan speed monitoring
- Flue gas temperature monitoring

- Flow monitoring using a combination of flow water temperature and flue gas sensor readings If one of these safety systems is activated, the boiler will go to an interlocking or lockout fault and will be switched off. Lockout faults can only be reset by pressing the reset button, after rectifying the fault.

3 Safety

Installation specifications

Read the specifications before commencing with installation.

The equipment should be installed by a recognised installer in accordance with applicable national and local standards and specifications.

The installation should only be used for heating systems with a maximum water temperature of 90°C.

It is expressly stated that these installation specifications should be regarded as a supplement to the above mentioned standards and specifications, which shall take priority over the information contained in this technical documentation.

Maintenance

Work on the electrical installation should only be carried out by a recognised installer in accordance with the applicable electrical regulations.

Work on the gas equipment and hydraulic installation should only be done by personnel having the required training, in accordance with the applicable safety rules and regulations for gas installations.

Do not place any objects on the boiler. Keep a safe distance from the hot water connection and the flue, due to the danger of burns.

Before starting with any maintenance and service work, shut off the electrical supply and close the gas valve to isolate the gas supply.

Check the entire installation for leakages after completing maintenance and service work. Casing parts may only be removed for maintenance and service purposes. After carrying out maintenance and service work, replace all the panels.

Safety devices

The installation should never be switched on with the casing panels removed unless undertaking repairs or preventative maintenance or the safety devices disabled.

Instructions and warning stickers

Instruction and warning stickers affixed on the appliance should never be removed or covered up, and should be maintained in a legible condition throughout the life of the appliance. Immediately replace damaged or illegible instruction and warning stickers.

Modification

The appliance may only be modified with the written permission of the manufacturer.

Danger of explosion

While doing work in the boiler room, follow the applicable rules and regulations entitled 'Working in Areas Subject to Danger of Explosion'.

Installation

The appliance should be installed by a recognised installer in accordance with applicable national and local standards and specifications.

Follow all the safety instructions precisely.

Operation

In case of a gas leakage: Prevent the boiler from operating and close the gas valve. Open doors and windows

and notify the relevant authorities.

When the appliance is restarted, follow the user instructions.

Technical specifications

The specifications contained in this technical documentation should not be exceeded.

4 Delivery and transport

4.1 Delivery

The boiler is delivered fully assembled, tested, and packed.

Check the boiler for damage after receipt.

Check whether the items delivered are correct and in accordance with the items ordered.

4.2 Packaging

The boiler is delivered in suitable cardboard packaging.

The types 45, 65, 85 and 100 can be stacked two high. It's not allowed to stack up the type 120.

4.3 Transport

Regarding transportation, refer to the technical data for dimensions and weights.

The packing should only be removed after transportation, or remove the panels before transportation. This is in order to prevent the panels from getting damaged.

Moving

Each boiler is packed in its own carton which has hand holed at both sides for lifting purposes.

Access requirements

The dimensions of the boiler are such that all the boiler types can be transported through a door opening of 60 cm.

Mounting

Install the WM using a spirit level on a sufficiently sturdy non-combustible wall using the suspension bracket provided. A template has been provided in the packing box, on which the positions of the fixing holes have been indicated.

Protection against frost

Boilers that are not used during the winter are in danger of freezing. Drain the system or add suitable inhibitor.

5 Installation

5.1 Regulations

The appliance should be installed by a recognised installer in accordance with the applicable national and local standards rules and regulations.

The commissioning should preferably be done by the Technical Services Department of MHS Boilers Ltd.

5.2 Installation area

5.2.1 General

- Thanks to the design of the boiler, radiation losses are negligible

- Due to the low noise level, there is no need for additional sound insulation of the room
- Due to its compact design, very little installation space is required
- The location options for the boiler are increased because it is supplied suitable for both open and room sealed operation (see chapter 5.3.4).

5.2.2 Installation

The following guidelines should be followed in order to optimise the installation of the boilers

- The boiler should be installed in a frost free room due to the risk of freezing of the condensate drain.

The built-in protection system is activated when the temperature of the central heating water falls below 5°C

- Pay attention to the location and temperature sensitivity of the boiler.
- Ensure that there is sufficient room around the boiler for maintenance and the replacement of components if necessary.

The recommended minimum clearance is as follows:

- 1000 mm to the front (free space for movement);
- 400 mm above;
- 250 mm below;
- 100 mm Either side;

5.2.3 Ventilation (BS5440/BS6644/IGE-UP10/Clean Air Act)

The ventilation of the installation room should conform to the applicable national and local standards and regulations. In connection with ventilation, keep in mind the following points:

- a. Follow the applicable national and local standards and regulations concerning the dimensions
- of the opening and the protection of the mechanical ventilation system if any
- b. The air inlet openings could be in two walls facing each other
- c. Use broad, low inlet grills
- d. The ventilation outlet should be at high level as high as possible
- e. In the case of insufficient air supply, it may be necessary to mechanically supply ventilation air.

5.3 Connections

5.3.1 Gas connection

The gas connection should be installed by a recognised installer in accordance with applicable national and local standards and specifications.

The gas connection is located on the bottom of the appliance.

The pressure on the inlet side of the appliance should be reduced to 20 mbar for natural gas and up to 50 mbar for propane, using a gas governor.

The pressure loss in the supply pipe should be such that the pressure never falls below 18 mbar for natural gas and 33 mbar for propane, when the appliance is at maximum load.

In order to guarantee that the gas valve works at all times, it is recommended that a gas filter is installed in the gas pipeline. The gas filter can be ordered as an option to be supplied with the boiler.

Install a gas isolating valve directly under the appliance.

5.3.2 Electrical connections

The electrical connections should be installed by a recognised installer in accordance with applicable national and local standards and specifications.

The appliance is fully wired in accordance with the electrical diagrams delivered with the appliance. All the electrical connections are located behind the control panel. The control panel can be easily opened after removing the locking screw. The cables to be connected (supply, control) enter through the bottom of the appliance via cable glands.



Fig. 4 Connections of the WM

The appliance is suitable for a 240 V 50Hz power supply with live/neutral/earth. Other connecting arrangements are only permissible if an isolating transformer is used. The appliance is phase

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sensitive. The boiler can be switched on and off using the on/off switch on the control panel. The installer should use a 2-pole main isolating switch with a contact opening of at least 3 mm in the supply circuit to the boiler. With this, the entire boiler (including the boiler supply pump relay) can be rendered volt free for maintenance work or in the case of failure.

In order to prevent faults due to electromagnetic fields, a screened cable should be used for the bus connection and for all sensor and control signals between the boiler and all external connection units. The screening should be connected on both sides according to the EMC Directives.

Controls and options

The boilers are equipped with a modulating control system. The temperature can be controlled via a 0-5 Vdc signal for example in response to external temperatures. If the voltage falls below 1 volt the boiler reverts to the set point set on parameter P1. A hot water priority circuit also forms part of the standard equipment, an additional sensor is required. Other options available on the boiler can be supplied to extend this.

Ultramax WM Boiler Range

0-5 Control Signal Interpretation.

Constant Temperature zone = Controller P1 Temperature Set Point



The three following options are available:

BM8

A weather-dependent temperature controller with the following features:

- Programming of 3 heating periods with different room temperatures
- Adjustable night time boiler flow temperature reduction operation
- Choice between 2 weekly programmes
- Hot water priority circuit with 2 heat up periods
- Override for single hot water period during night time reduced flow temperature operation
- Optimum start time calculation
- Room temperature control with or without external temperature influence
- Option of internal (standard) or external room sensor (option)
- Adjustable response of the flow temperature to sensed room temperature

- Calibration of the room sensor
- Delay to flow temperature compensation due to external temperature up to a maximum of

3 hours

- Holiday Programme
- Frost protection system based on external temperature or room temperature
- Remote activation via telephone if no external room sensor fitted (external relay required)
- Optimisation of compensation slope based on room temperature and external temperature with optimum start time adjustment
- Hot water Anti-legionella bacteria function
- Option of switching off internal room sensor
- 2-wired communication (scom-bus)
- Display in 6 different languages
- External display of KM628 functions with display of status, operating hours, number of starts,

degree of modulation and temperatures.

BM8 Room Unit

Room Unit Mounting Plate Wiring Terminals



Terminal Designation

When connected to a	Single Ultramax B	Roiler (2 Wire SCOM)
	Onigio Onianiaz D	

Terminal #s	Voltage	Screened Cable (Earthed Screening)	Description/Operation/Function
3 & 5	<25\/	Voc	SCOM Communication to boiler
(Polarity Sensitive)	~25V	Tes	(3 - & 5 +)
3 & 6	<25\/	Vaa	Tamperproof RFB Remote
(Not Polarity Sensitive)	~25V	Tes	Sensor or Volt Free Enable
1 & 2 & 4	-	-	Not Used

When connected to a KKM8 or E8 Manager/Controller via a COCO2 (4 Wire CAN)

Terminal #s	Voltage	Screened Cable (Earthed Screening)	Description/Operation/Function
1 & 2 & 3 & 4	<25\/	Voc	CAN Communication to Controller
(Polarity Sensitive)	~25V	Tes	1 H, 2 L, 3 –, 4 +
3 & 6	<25\/	Vac	Tamperproof RFB Remote Sensor
(Not Polarity Sensitive)	~20V	res	or Volt Free Enable
5	-	-	Not Used

E8.1121

This is a control system for the weather dependent control of two secondary heating circuits. In addition, a hot water circuit can also be controlled at two different Set Points. All the settings can be made separately for each secondary circuit. This E8 controller can be further extended with an optimisation controller system for each secondary group (BM8). The weather dependent control of the boiler is done indirectly by the E8.1121.

There are the following additional features to the BM8:

- The maximum flow temperature can be set for each heating circuit

- The compensation slope can be manipulated with a parallel displacement to the desired flow temperature of the boiler

- Time controlled hot water Secondary pump
- Pump-exercise function
- DCF receiver for internal clock (optional receiver required)
- Communication over a CAN-bus
- Integrated relay and sensor test
- Can be used in stand-alone operation

Controller Wiring Terminals.(Rear of controller)(Housing available)



Terminal Designation

Block	Terminal #s	Voltage	Screened Cable (Earthed Screening)	Description/Operation/Function
II	1	230V	-	Permanent Neutral
	2&3	230V	-	Permanent Live
	4	230V	-	Heating Zone 1 Pump 230V Output (Max 1 Amp)
	5	230V	-	Heating Zone 2 Pump 230V Output (Max 1 Amp)
	6	230V	-	Do Not Use (Not Used With Ultramax Boilers)
	7	230V	-	Heating Zone 2 Mixing Valve 230V 'Open' Output (Max 0.5 Amp)
	8	230V	-	Heating Zone 2 Mixing Valve 230V 'Close' Output (Max 0.5 Amp)
	9 & 10	230V	-	Do Not Use (Not Used With Ultramax Boilers)
VI	1	230V	-	Do Not Use (Multifunctional Relay 1 Output)
	2	230V	-	Do Not Use (Not Used With Ultramax Boilers)
IV	1	230V	-	Heating Zone 1 Mixing Valve 230V 'Open' Output (Max 0.5 Amp)
	2	230V	-	Heating Zone 1 Mixing Valve 230V 'Close' Output (Max 0.5 Amp)
	3 & 4 & 5	230V	-	Do Not Use (Not Used With Ultramax Boilers)
	4 (Polarity	-05) (Vaa	
	Sensitive)	<20V	165	+ Control Communication Bivis / E8 / COCO2" ("For Boller Control.)
IV	3 (Polarity	<25\/	Vaa	Control Communication BM8 / E8 / COCO2* /*Ear Bailer Control)
	Sensitive)	~25V	Tes	
IV	2 (Polarity	<25\/	Voc	L Control Communication BM8 / E8 / COCO2* (*Ear Bailer Control)
	Sensitive)	~237	163	
IX	1 (Polarity	<25\/	Ves	H Control Communication BM8 / E8 / COCO2* (*Eor Boiler Control)
	Sensitive)	-201	103	
III	3 & 2	<25V	Yes	Heating Zone 2 Volt Free Enable (3 + , 2 Ground).
	1	<25V	Yes	Do Not Use (Not Used With Ultramax Boilers)
VIII	2 & 1	<25V	Yes	Do Not Use (Multifunctional Relay 1 Sensor Input)
V	2 & 1	<25V	Yes	Heating Zone 1 Flow Sensor (VFAS)
				Outside Air Sensor (AFS)
I	10 & 9	<25V	Yes	(Mounted on North Facing Wall)(BM8 Required to activate weather
		051/		compensation)
	8&/&6	<25V	Yes	
	5&4	<25V	Yes	Heating Zone 2 Flow Sensor (VFAS)
	3 & 2	<25V	Yes	Heating Zone 1 Volt Free Enable (3 + , 2 Ground).
	1	<25V	Yes	Do Not Use (Not Used With Ultramax Boilers)
VII	2 & 1	<25V	Yes	Do Not Use (Not Used With Ultramax Boilers)

KKM8

This is a boiler cascade manager with which up to 8 boilers can be connected in cascade and an extra on/off boiler can be operated. The KKM8 also has the same functional features as the E8.1121.



Controller Wiring Terminals.(Rear of controller)(Housing available)

Terminal Designation (230 Volt Terminals)

Block	Terminal #s	Voltage	Screened Cable (Earthed Screening)	Description/Operation/Function
Ш	1	230V	-	Permanent Neutral
II	2&3	230V	-	Permanent Live
II	4 (A1)	230V	-	Heating Zone 1 Pump 230V Output (Max 1 Amp)
П	5 (A2)	230V	-	Heating Zone 2 Pump 230V Output (Max 1 Amp)
Ш	6 (A3)	230V	-	Hot water Charging Pump 230V Output (Max 1 Amp)
	$\overline{7}$ (AA)	2201/		Heating Zone 2 Mixing Valve 230V 'Open' Output (Max 0.5
	7 (A4)	2300	-	Amp)
II 8 (A5) 2	(45) 230)/		Heating Zone 2 Mixing Valve 230V 'Close' Output (Max 0.5	
	2300	-	Amp)	
П	9 & 10	230V	-	Do Not Use (Volt Free Stage One Burner Enable)
VI	1 & 2	230V	-	Do Not Use (Volt Free Stage Two Burner Enable)
				Heating Zone 1 Mixing Valve 230V 'Open' Output (Max 0.5
IV	1 (A8)	230V	-	Amp)
				(Multifunctional Relay 1 Output)
				Heating Zone 1 Mixing Valve 230V 'Close' Output (Max 0.5
IV	2 (A9)	.9) 230V	-	Amp)
				(Multifunctional Relay 2 Output)

IV	3	230V	-	Do Not Use (Not Used With Ultramax Boilers)
N/	4	2201/		Not Generally Used (Multifunctional Relay 3
	4	230V	-	Output/Secondary Circulating Pump Live Output)
N/	F	2201/		Not Generally Used (Solar Panel Transfer Pump 1 /
	5	230V	-	Multifunctional Relay 4 Output)
Termin	al Designation ((Sensor and	low voltage te	erminals)
	4 (Polarity	<25\/	Vaa	+ Control Communication BM8 / E8 / COCO2* (*For Boiler
	Sensitive)	~ 25V	res	Control.)
	3 (Polarity	<25\/	Vaa	- Control Communication BM8 / E8 / COCO2* (*For Boiler
	Sensitive)	~ 25V	res	Control.)
	2 (Polarity	-0FV/	N	L Control Communication BM8 / E8 / COCO2* (*For Boiler
	Sensitive)	<25V	res	Control.)
	1 (Polarity	-05)/	Maria	H Control Communication BM8 / E8 / COCO2* (*For Boiler
	Sensitive)	<25V	res	Control.)
	3 (F17) & 1	-05) (Maria	0-10 Volt Control Input (3 + , 1 -) (Parameter alteration
	(F15)	<25V	Yes	Required)
	2 (씨) & 3	.05) (Ň	
	(F17)	<25V	Yes	Heating Zone 2 Volt Free Enable (3 + , 2 Ground).
Van	2 (F14) & 1	<05\/	Vaa	Not Generally Used (Solar Panel Sensors / Multifunctional
VIII	(F13)	<20V	res	Relays 3 & 4 inputs)
V	0 (F40) 0 L	.05) (Vaa	Not Generally Used (Solar Vessel Panel Sensors /
v	2 (F12) & 🛲	<20V	res	Multifunctional Relay 2 input)
V	4 (511) 0	<25\/	Vaa	Heating Zone 1 Flow Sensor (VFAS) (Multifunctional Relay 1
v	ι (ΓΙΙ) α π	~25V	Tes	input)
	10 (1) 8 0			Outside Air Sensor (AFS)
1	10 (#) & 9 (E0)	<25V	Yes	(Mounted on North Facing Wall)(BM8 Required to activate
	(Г9)			weather compensation)
	8 (F8) & 7	<25\/	Vaa	Low Loss Header Samer (KES)
	(土)	~25V	Tes	LOW LOSS Header Serisor (KFS)
	6 (F6) & 7	<25\/	Vee	Hat Water Storage Tank Sensor (SDES)
•	(土)	~23V	165	The Water Storage Tank Sensor (SFFS)
	5 (F5) & 4	~25\/	Voc	Heating Zone 2 Flow Sensor (V/EAS)
•	(土)	~25V	165	
	3(F3) – 2	<251/	Voc	Heating Zone 1 Volt Eros Enable (3 + 2 (Plack III) Crownd)
	(#) (III)	~20V	162	
	2(F2) & 1	<251/	Vee	Do Not Liso (Not Lisod With Liftramov Boilors)
	(F1)	~23V	res	
VII	2 & 1	<25V	Yes	Do Not Use (Not Used With Ultramax Boilers)

WM Connecting terminals

The operation of the appliance can be influenced by externally generated signals applied to the appropriate terminals.



Rear Of KM628 Boiler Controller



Terminal Designation

	Terminal #s	Voltage	Screened Cable (Earthed Screening)	Description/Operation/Function	
	6 & 7	< 25V	-	Do Not Use	
	21 & 22 (Not Polarity Sensitive)	230V	-	Internal Resistor for Hot Water Generation Control via Volt Free Enable Hot Water Volt Free Enable. (/ia Time Switch/Room Thermostat/BMS)	
	13	< 25V	-	Do Not Use (Primary PWM + Pump Output)	
	12	< 25V	-	Do Not Use (Primary PWM - Pump Output)	
	11	< 25V	Yes	BM8 / KKM8 / E8 SCOM + Data Input (KKM8 & E8 Communication via a COCO2 Unit)	
	10	< 25V	Yes	BM8 / KKM8 / E8 SCOM - Ground Input (KKM8 & E8 Communication via a COCO2 Unit)	
	9	< 25V	Yes	0-5 Volt Control Signal Input. (If not in use link to terminal 8)	
	8	< 25V	Yes	0-5 Volt Control Signal Input. (If not in use link to terminal 9)	
	7&6	< 25V	Yes	Hot Water Sensor (SPFS).	
	5 & 4	230V	-	Heating Volt Free Enable. (Via Time Switch/Room Thermostat/BMS)	
	3 & 1	230V	-	Safety Interlock Volt Free Enable (For use with ventilation interlocks/gas pressure switch etc.)	
	2	230V	-	Switched Neutral	
	1	230V	-	Switched Live	
	Ν	230V	-	Permanent Neutral	
	L1	230V	-	Permanent Live (Max 5 Amp)	
	E	230V	-	Common Permanent Earth	
	ST2 1&2	< 25V	Yes	Outside Air Sensor (AFS) (Mounted on North Facing Wall)(BM8 Required to activate weather compensation)	
	ST11 2 & 1	230V	-	Hot Water Charging Pump 230V Output (2 Live, 1 Neutral) (Max 1 Amp)	
	ST11 4 & 3	230V	-	Boiler Pump 230V Output (4 Live, 3 Neutral) (Max 1 Amp)	
	ST32 1 & 2	< 25V	Red Jumper	Cascade Bus Power Interrupt (Apply Jumper ton boilers 3 – 8 on KKM8 Controlled Systems)	
ay Le	egend				
	Relay Tag	Coil Voltage	Switching Voltage	Description/Operation/Function	
	K1	230V	< 25V	Internal Safety Interlock / Switching Flow switch and Air Pressure Switch Terminals	
-	K2	230V	< 25V	External Safety Interiock / Switching Hue Gas sensor	

191007

Gas Valve out for WM 120 units only (230V Gas Valve)

230

Terminal: Description:

- **L1-N-Earth** Supply for the boiler should be installed with 6A fuse protection. If miniature circuit breakers are used, these should have C Rated characteristics.
- 1-3 Lockout circuit (240 Vac from boiler, 1A). If the connection between the two terminals is broken, the boiler will immediately go into a lockout condition and will remain out of operation until this connection is restored and has been reset using the lockout reset button.
- **4-5** On/Off. By connecting the two terminals to each other, the boiler is switched from the standby mode to the operating mode and can start when there is a heat requirement. These terminals can be used for thermostatic functions for the boiler. If the circuit is interrupted, the boiler goes into the stand-by mode, except for hot water generation.
- 6-7 A hot water temperature sensor can be connected to these terminals. This is recognised automatically by the boiler controller when the supply voltage is switched on. The reading from this sensor is used for controlling the hot water temperature. *(If a Volt free enable is used in place of a HWS sensor use terminals 21-22 and not 6-7.)*8-9 External flow temperature adjustment. A 0-5 Vdc (-10 to+90°C) analogue signal can be applied at these terminals. If the voltage is less than 1 Vdc, it will change over to the internal set flow temperature (set at P1).
- **10-11** Connection terminals for the 2-wire bus signal (scom-bus). Pay attention to the polarity: namely, terminal 10 is earth and 11 is positive.
- **ST 1.1-1.2** An OK (appliance healthy) signal is available at these terminals (240 Vac from external, 1A, NO). This circuit will be interrupted if more than 2 identical faults occur within 6 minutes (the display will show an error code with a "3" appearing above it) or if a fault remains for more than 6 minutes.
- **ST 2.1-2.2** An outdoor sensor can be connected to these terminals. The automatic control unit of the boiler will automatically detect this connection when the supply voltage is switched on. The reading from this sensor is used for frost protection and for weather-dependent control of the flow temperature of the boiler when fitted with the optional BM8, E8.1121, or KKM8 5064.
- **ST 9.3-9.4** Interlock circuit (240 Vac from boiler, 1A). If the connection between the two terminals is broken, the boiler will go into a fault condition and remain out of operation until this connection is restored.

Attention! If the situation lasts for more than 6 minutes, or if it occurs more than twice within 6 minutes, the boiler will go into a lockout fault and remain out of operation until this connection is restored and is reset using the reset button.

ST 11.1-11.2 Control for the hot water primary pump (240 Vac from boiler, 1A), of which terminal 11.2 is the phase (L) wire and terminal 11.1 is the neutral (N) wire.

Heating Pump Control Relay (SPDT).

(To Enable Priority Hot Water Operation Without the Application of an E8 Zone Controller.)

Rear Of KM628 Boiler Controller



Terminal Designation

Controller Terminal	Relay Terminal	Voltage	Description/Operation/Function	
#5	#8			
ST11 1	A1	230V	Hot Water Charging Pump 230V Neutral Output (Max 0.5 Amp)	
ST11 2	A2	230V	Hot Water Charging Pump 230V Live Output (Max 0.5 Amp)	
QT11 2	NI/A	N1/A	2201/	Boiler Pump 230V Neutral Output (Max 0.5 Amp)
51115	N/A	2307	Heating Pump Neutral Output (Max 0.5 Amp)	
OT11 4	11 4 COM	230V	Boiler Pump 230V Live Output (Max 0.5 Amp)	
51114			Heating Pump Live Output Via Relay (Max 0.5 Amp)	
N/A	NC	230V	Heating Pump Relay Switched Live Output (Max 0.5 Amp)	



Ultramax BMS Run and Fault Indication Relays (Optional Extra)



Terminal Designation (Boiler Run Indication Relay)

Controller Terminal	Relay Terminal	Voltage	Description/Operation/Function		
#s	#s				
ST11 /	۸1	230\/	Relay Coil Live Input From Terminal ST11.4		
3111.4	AI	2307	Located on the rear of the KM628 boiler controller.		
QT11 2	40	2201/	Relay Coil Neutral Input From Terminal ST11.3		
5111.5	AZ	2300	Located on the rear of the KM628 boiler controller		
NI/A	COM	COM	External Control System	Input Connection For Boiler Run Indication.	
N/A	COM	Dependant (230V 0.5 Amp Max)	(Common Terminal of Single Pole Double Throw Relay Switch)		
N1/A	NO	External Control System	Output Connection For Boiler Run Indication.		
N/A		Dependant (230V 0.5 Amp Max)	(Normally Open Terminal of Single Pole Double Throw Relay Switch)		
N/A	NC	External Control System Dependant (230V 0.5 Amp Max)	Terminal Not usually Used For Boiler Run Indication Relays (Normally Closed Terminal of Single Pole Double Throw Relay Switch)		

Terminal Designation (Boiler Fault Indication Relay)

Controller	Relay				
Terminal	Terminal	Voltage	Description/Operation/Function		
#s	#s				
			Relay Coil Live Input From Terminal ST1.2 Located on the rear of		
ST1 2	A 1	230V	KM628 boiler controller. (Terminal ST1.1 Located on the rear of KM628		
511.2	AI		boiler controller must connected to terminal 1 on main terminal rail to		
			provide a 230v supply)		
Boiler	۸۵	2201/	Polov Coil Noutral Input From Torminal 2		
Terminal 2	AZ	2300			
NI/A	СОМ	External Control System	Input Connection For Boiler Fault Indication.		
N/A		Dependant (230V 0.5 Amp Max)	(Common Terminal of Single Pole Double Throw Relay Switch)		
N1/A	NO	External Control System	Terminal Not usually Used For Boiler Fault Indication Relays		
N/A		Dependant (230V 0.5 Amp Max)	(Normally Open Terminal of Single Pole Double Throw Relay Switch)		
NI/A	NC	External Control System	Output Connection For Boiler Fault Indication. (Normally Closed		
IN/A	NC	Dependant (230V 0.5 Amp Max)	Terminal of Single Pole Double Throw Relay Switch)		

5.3.3 Water connections

It is recommended that the flow and return pipes are securely fixed with brackets. This prevents damage and makes maintenance easier.

The boiler is deigned for use on sealed pre-pressurised systems only and is **not suitable for use in open vented systems.** In such cases, a plate heat exchanger should be installed, with which system isolation can be achieved.

The capacity and head of the internal boiler pump (WM 45, 65 and 85 Only) is sufficient to overcome not only the boiler resistance but also some system resistance (see table 1).

It is recommended that manually operated valves should be installed between the water connections and the installation.

In order to limit standby losses further, a motorised valve is sometimes installed in the flow or return pipe work, or a mechanical non-return valve may be used for this purpose. (Pump interlocks required) Standby losses can be further limited by switching off the boiler via the enabling control circuit.

5.3.4 Flue gas outlet and air inlet

5.3.4.1 Connection possibilities

During installation, a choice can still be made between a 'room sealed' and an 'open' version. The standard eccentric connection can also be easily changed into a concentric connection. The flue gas discharge outlet and air intake system should be installed by a recognised installer according to applicable national and local standard and specifications.

• Type B23:

Open type appliance without draught stabiliser, air supply from the room, flue gas discharge outlet above the roof.

• Type C13:

Room Sealed appliance, connected to a concentric air supply / flue discharge through the wall

• Type C33:

Room Sealed appliance, connected to a concentric air supply / flue discharge through the roof

• Type C43:

Room Sealed appliances in cascade, connected to a common concentric air supply / flue discharge at the appliance.

• Type C53:

Room Sealed appliance, connected to a separate air supply and flue discharge pipe, opening into different pressure areas.

• Type C63:

Room Sealed appliance, sold without related connecting and/or discharge fittings

• Type C83:

Room Sealed appliances in cascade, connected to separate air supplies but common flue discharge through the roof.

5.3.4.2 Air inlet pipe

The air supply pipe may be single wall, smooth or flexible, and be made of:

- plastic
- aluminium
- stainless steel

Always consider the large resistance when using flexible material.

Always consider condensate formation due to the suction of cold air.

Туре	Diameter of air inlet D1 (mm)
WM/45	80
WM/65	80
WM/85	100
WM/100	100
WM/120	100

Table 3 Diameter of air inlet

The connection for the air supply is on the top of the boiler.

The air supply pipe should be airtight. This is to prevent the suction of 'false air'. Horizontal components in the air supply should be installed sloping in the direction of the supply opening.(Fresh air opening)

5.3.4.3 Flue gas outlet

The flue gas components may be single wall, smooth, Rigid or flexible, and be made of:

- plastic
- stainless steel

Always consider the resistance when using flexible material.

Туре	Diameter of Flue Gas D (mm)
WM/45	80
WM/65	80
WM/85	100
WM/100	100
WM/120	100

Table 4 Diameter of flue gas outlet

The flue gas outlet is located on the top of the appliance and is designed for direct connection to a corrosion resistant flue pipe.

MHS Boilers Ltd ©

The flue gas discharge pipe to be used should be airtight and watertight at the joints and connections, or should be seamless. Horizontal components in the flue pipe should be installed sloping in the direction of the appliance (minimum 5 cm per meter).

Due to the high operating efficiency of the appliance, there may be condensate formation in the chimney even at high water temperatures.

The condensate drain should never be blocked!

A direct connection to a brick chimney is not permissible, since the chimney losses must be less than 17%.

The following table gives the flue gas data for all the types

Type Maximum flue gas temperature at full load		Quantity of flue gas at full load		Maximum permissible flue resistance	
	°C	m3/h	kg/s	mbar	
WM/45	70	74	0.020	1.4	
WM/65	70	113	0.031	1.4	
WM/85	70	149	0.041	1.4	
WM/100	70	168	0.046	1.4	
WM/120	70	209	0.058	2.0	

Table 5 flue gas data

Load 100%

Flow temperature 80 °C

Return temperature 60 °C

5.3.4.4 Flue

Flue length

Since the boiler is equipped with a "premix burner" with a fan, an overpressure is created in the

boiler. This overpressure is sufficient to overcome the resistance of the burner, the heat exchanger,

and the chimney.

The back pressure outside the boiler depends on:

- a. the resistance of the flue pipe
- b. the degree of cooling of the combustion gases
- c. the resistance of the discharge outlet

The degree of cooling of the combustion gases depends on the following:

- a. the insulation value of the flue
- b. the ambient temperature
- c. the flue system and outlet

There is a maximum overpressure of around 1.4 mbar (140 pa) for the types 45, 65, 85, 100 and

2.0 mbar (200 pa) for the type 120 in the boiler for the flue gas discharge system. (Table 5)

Calculation of diameter and length

For the calculation and control of the inner diameter of a discharge system with mechanical discharge, please refer to the applicable national and local standards and regulations.

		Maximum Length of flue in m						
	Diameter 70 mm	Diameter 80 mm	Diameter 90 mm	Diameter 100 mm	Diameter 110 mm	Diameter 130 mm		
WM/45	18	40*	n.a	n.a	n.a	n.a		
WM/65	n.a.	12*	39	67	n.a.	n.a.		
WM/85	n.a.	n.a.	18	32*	70	n.a.		
WM/100	n.a.	n.a.	n.a.	22*	40	80		
WM/120	n.a.	n.a.	n.a.	35*	38	72		

Table 6 Length of flue

The above flue pipe lengths have been rounded down.

* Flue diameter on the boiler

These lengths apply to open type appliances.

For room sealed appliances, these lengths apply to inlets and outlets combined. Flue losses of various flue components expressed in meters of straight pipe. The total loss should be subtracted from the maximum permissible flue length from the previous table.

Туре	Diameter in mm	Pipe bend 90° R/D =0.5	Pipe bend 90° R/D = 1	Pipe bend 45° R/D =0.5	Т-ріесе
WM/45	70/80*	3.5/4.0	1.1/1.2	1.1/1.2	4.0/4.0
WM/65	80*/90/100	4.0/4.5/4.9	1.2/1.3/1.4	1.2/1.3/1.4	4.0/4.3/4.5
WM/85	90/100*/110	4.5/4.9/5.4	1.7/1.8/2.0	1.3/1.4/1.5	4.5/4.9/5.4
WM/100	100*/110/130	4.9/5.4/6.2	1.8/2.0/2.2	1.4/1.5/1.6	4.9/5.4/6.0
WM/120	100*/110/130	4.9/5.4/6.2	1.8/2.0/2.2	1.4/1.5/1.6	4.9/5.4/6.0

Table 7 Flue losses in metres of straight pipe

* Connection to the appliance

If concentric discharge from the appliance is used, the following maximum lengths (excluding roof clearance) are permissible:

Туре	Diameter in mm	Maximum length of bends	ˈstraight pipe in m Nı	ımber of 90 ° pipe
		2	4	6
WM/45	80	17	14	12
WM/65	80	4	3	1
WM/85	100	16	14	13
WM/100	100	9	7	5
WM/120	100	10	8	6

Table 8 Maximum length of straight pipe

5.3.5 Condensate drain

Condensate water is formed due to the condensation of flue gases, and this has to be drained from the boiler. Pipe the condensate water directly into the waste water drain system. If there is no direct connection to the drain system, a water collection tank equipped with pump and level switch may be used to pump the condensate water into the drain system. (Available as an optional extra) In view of the acidity, only plastic drainpipes should be used. Fill the bottle trap with water after installation; the bottle trap beaker on the bottom of the boiler can be easily removed to do so. Ensure that there is an open connection between the drain system and the boiler bottle trap. It is not permissible for condensate to be drained into guttering, since the condensate may freeze.

5.4 Hydraulic system

Generic Single Boiler Configuration



5.4.1 Water flow

5.4.1.1 Flow and resistance

The minimum required water circulation through the boiler should be maintained at all times (equivalent to Δt 25 K at full load). The minimum required water circulation should not be adversely affected by the use of valves, non-return valves, systems in which several boilers are connected to a common distribution pipe, etc. The maximum water flow is achieved at Δt 15 K.

Туре	∆t 20 K		Pump data					
	Nominal flow rate Q	Boiler resistance nom. flow R	Pump type WILO (Equivalent or better)	Pump speed	Pump head at nom. flow Q	Available head at nom. flow Q	Maximum* Power consumption	
	m3/h	KPa			KPa	KPa	W	
WM/45	1.68	14	RS 25/6-3	max	40	26	93	
WM/65	2.57	20	RS 25/7-3 PWM/3c	max.	49	29	132	
WM/85	3.38	25	RS 25/7-3 PWM/3c	max.	40	15	132	
WM/100	3.78	28	TOP-S 30/7	3	52	24	195	
WM/120	4.70	30	TOP-S 30/7	3	42	12	195	

Table 9 Water flow quantity and pump data for the WM

Maximum power consumed is given in pump position 3

WM/100 & 120 Wilo pumps type shown for guidance, equivalent or better pump can be utilised.

When using another Δt you can use the following formula for calculating the flow rate and resistance of the boiler.

Flow rate

$$Q = \frac{20}{\Delta T_{new}} *$$
 Nom. flow rate

Boiler resistance

$$R = \left(\frac{20}{\Delta T_{new}}\right)^2 * \text{ Boiler res. at nom. flow}$$

After this you have to check the available head of the pump.

The boiler has a pump control circuit. When the boiler is enabled, the pump is switched on. If the boiler is disabled, the pump will continue to run for a few minutes more. This run on time can be adjusted. The standard time is 2 minutes.



5.4.1.2 Pump characteristics (Wilo curves shown for guidance. Equivalent or better pumps can be utilised.)

Fig. 5 Pump characteristics

5.4.1.3 Shut-off valves

It is recommended that manual valves should be installed between the flow and return connections to the installation.

5.4.1.4 Valves

It is possible to install mechanical non-return valves. These valves are intended to prevent waterside short circuiting over the switched-off boiler.

5.4.1.5 Water flow protection device

The boiler is equipped with a water flow protection device.

The flow sensor and the flue gas sensor ensure that the protection device gets triggered if the water flow is too low.

5.4.2 Water pressure

5.4.2.1 Operating pressure

At a maximum flow temperature of 90°C and with the minimum water flow that occurs at a Δt of 20K, the minimum operating pressure should be at least 1.5 bar. The operating pressure should be measured when the pump is switched off. If a lower operating pressure is required, it is necessary to adjust the maximum flow temperature.

Minimum operating pressure in bar	Flow temperature in °C
>1.5	90
>1	80

Table 12 Minimum operating pressures at a rated volume flow of Q

5.4.2.2 Boiler expansion vessel

It is recommended that a boiler expansion vessel is installed in the return pipe work between the pump and the boiler shut off valves.

5.4.2.3 System expansion vessel

The size of the expansion vessel is determined by the water volume of the system. We recommend that the system expansion tank is placed in the zero point of the low loss header.

5.4.2.4 Water pressure protection device

Install a pressure relief safety valve within 0.5 m of the appliance in the pipe between the appliance and the shut-off valves if any, in accordance with BS6759. The size of this safety valve should sized in accordance with the kW rating and system pressure.

5.4.3 Water temperature

The maximum permissible water flow temperature is 90°C. If the limit thermostat is triggered at 97°C, the boiler will switch off and will automatically restart when the water temperature falls below the limit temperature that has been set. The high limit thermostat is set to 100°C, if activated the boiler will switch off and will not automatically restart when the water temperature falls.

5.4.4 Water quality (BS 7593)

The composition and quality of the system water has a direct effect on the performance of the system as a whole, and the life of the boiler. Inappropriate addition and use of chemicals, water softeners, oxygen components, de-aerators, aerators, and water filters increase the chance of faults.

Corrosive elements in some additives may corrode the system, giving rise to leakages; undesirable deposits often damage the boiler heat exchangers.

In connection with the hardness of the water, a distinction should be made between the following:

a. Temporary hardness:

This is also termed carbonate hardness. Deposits are formed at higher temperature and can be removed easily.

b. Permanent hardness:

Minerals (for example calcium sulphate) in the water that are deposited due to very high surface temperatures.

The water hardness is generally expressed in terms of "ppm" and is sub-divided into the following:

Very soft	< 50 ppm
Soft	50-160 ppm
Moderately hard	160-250 ppm
Hard and very hard	< 250 ppm

The system should contain soft to medium hard water, with the water hardness that does not exceed 250 ppm at a flow temperature of 80°C and Δt 20 K.

Before supplying water, the hardness and chloride value of the system water should always be determined.

The chloride value should never exceed 200 mg/l.

If the chloride value does exceed this value, the cause should be determined. Compare the chloride value of the supply water and the central heating system water. If this content is much higher, and if no materials containing chloride have been added, this indicates evaporation. If the chloride content is very high, the water is rendered more aggressive. (Can be caused by, amongst other things improperly regenerated water softener). The system should be flushed clean and filled with low chloride water.

In order to counter unnecessary wear and tear and blockages due to impurities present in the system, we recommend the use of a filter system with a mesh size of 100 microns. Always place this in the return line of the secondary part of the system.

In order to guarantee a properly working system and long life, one should remove suspended and corrosive particles by installing a suitable filter system.

The periodic inspection including the analysis of the system water and the cleaning of the filters should be performed.

It is imperative that the system is treated with suitable corrosion and scale inhibitors. The concentration of the dosage must be monitored and maintained on a regular basis. Failure to comply with these requirements will render the appliance warranty null and void.

6 Operating instructions

6.1 Operation

The fan, which is modulated by the temperature controller, supplies the combustion air. Due to the resultant under pressure in the venturi, the zero pressure controller in the gas valve mixes in the required quantity of gas. Gas and air are completely mixed in the venturi.

The gas-air mixture is then passed directly in to the burner. The fan also assists with the removal of the combustion gases from the flue. The boiler has no lower limit to the return water temperature. If this temperature is low, condensate will be formed, which is removed via the discharge system.

6.2 Controls

Depending on the heat requirement of the boiler, the load should be modulated between 14% and 100%. Below 14% load, the boiler operates on/off, based on temperature.

6.3 Boiler module KM628



Fig.6 Boiler module

1 Function

- () standby
- ② automatic operation
- summer operation
- A service operation
- 2 Function selector (Rotational Selector)
- 3 fault indication
- 4 supply temperature
- 5 malfunction code (flashing)
- 6 operation mode
-) night time reduction (no heating demand)
- ** heating mode (heating demand)
- ⅔ (flashing) burner operating





1 Parameter indication

- P1 current/setting boiler supply temp.
- P2 current/setting domestic hot water
- temperature
- *P3 desired temperature
- P5 current external temperature
- P8 current low velocity header temp.
- P9 current/maximum boiler capacity
- P10 password entry for factory settings
- 2 optical computer communication port.
- 3 reset/programming push-button
- 4 alarm LED
- 5 parameter/value selector (Rotational Selector)
- 6 output status
- 7 current/desired parameter value
- 8 fault/parameter indication
- 9 input status

* P3 set load (in combination with KKM8/E8)

Operating mode (cover closed)

With the cover closed and by using the Rotational Selector (pos. No. 2) clockwise or anti-clockwise the boilers' operating mode can be set.

The operating modes are:-

் standby	the boiler switched off but frost protection is active
 e automatic 	the boiler can operate in heating or hot water mode
Summer mode	the boiler will only react to a hot water demand
₿I service,	low capacity the boiler will run at low capacity (adjusted by [P17])
å∏ _{service,}	high capacity the boiler will run at full capacity (adjusted by [P19]).

Information mode

With the cover open and by turning the rotational switch (Pos. No 5) clockwise or anti-clockwise it is possible to read out certain information from the boiler management unit.

There are 10 possibilities. An arrow at the bottom of the LCD display will indicate which parameter has been selected. The following parameters are readable:-

Parameter

P1 actual/setting flow temperature
P2 actual/setting direct hot water temperature (if used)
P3 set point temperature (* P3 set load in comb. with KKM8/E8)
P5 actual outside temperature (if used)
P8 temperature at the low velocity header (if used)
P9 actual / setting boiler capacity
P10 only for MHS trained service engineers. (Password protected)

Summary of input and output indications (cover open)

Input indications: -

- Flame Ionisation detected
- **SW** Water flow switch in operating position
- $\ensuremath{\text{DW}}$ Air Pressure Switch in operating position

RT Boiler enabled by Volt Free Enable. Required under all control options.

Bus Data-bus detected. BM8 / KKM8 / E8

Output indications: -

- ℵ Power to Main Gas Valve
- 4 Power to Ignitor
- Control signal to fan
- Power to Primary Boiler Pump
- Power to Primary DHW Pump.

Setting the required flow temperature for central heating system operation.

Attention! This setting is not active if a KKM6/8, E6/8 or BME/BM8, or an external 0-5 V signal is connected.

- Open the lid of the KM 628, and a black arrow will appear above P1.
- Press the reset/programming button (item 3); the red LED will light up, then turn the rotary

selection switch until the desired temperature appears in the display.

- Again press the reset/programming button: the red LED will go out
- The new flow temperature will now be active
- Close the lid.

Set the required hot water temperature for hot water operation. This is only applicable if the hot water mode is being used.

- Open the lid
- Turn the rotary switch until the arrow at the bottom of the LED displays parameter P2
- Press the reset/programming button (item 3), the LED lights up, then turn the rotary switch
- (item 5) until the desired hot water temperature appears in the display
- Again press the reset/programming button; the LED will go out
- The new value will now be active
- Close the lid

6.4 Fault signals

In the case of the fault, a flashing \triangle and an error code will constantly appear in the display. In the case of a fault, the cause should first be eliminated before the relevant safeguard is reset. The OK signal will be lost if a fault occurs more than twice within 6 minutes (the error code will be shown in the display with a "3" appearing above it), or in the case of a fault that remains active for more than 6 minutes.

1 High Limit thermostat (STB) has been triggered

If the flow temperature has risen above 100°C the high limit will be activated.

Wait until the flow temperature is below the value set for at least one minute and then reset this safety function by pressing the reset button.

2/3 Interlock circuit has been interrupted

An external safety device connected to the terminals (ST 9.3-9.4) has been triggered. Check and repair this safety device.

4 No flame signal when the burner starts

No flame is detected within the preset safety time when burner starts. Restart is possible if programmed.

5 Flame signal lost during operation

When the burner is in operation, the measured ionisation has fallen below $1\mu A$.

6 Limit temperature monitoring system has been triggered

The flow temperature has risen above the value set for the same, or the water flow is too low.

7 The maximum flue gas thermostat has been triggered

The flue gas temperature has gone above 100°C. Repair the fault and press reset.

11 Faulty flame signal

An ionisation signal of higher than 1µA has been measured while the burner was not in operation. Repair the fault and press reset.

12 Defective flow temperature sensor

The measured resistance value of the flow temperature sensor is outside the range of -10 and +126°C. Repair the fault and press reset.

13 Defective flue gas temperature sensor/lockout input is interrupted

The resistance value measured by the flue temperature sensor lies outside the range of -10 and +126°C. Repair the fault and press reset.

An external safety device connected to the terminals (1-3) has been triggered. Check and repair this safety device. K2 Relay or associated wiring error. Relay coil supplied from main terminals 3&N, Switched terminal 11&14 Flue sensor & ST3 3 and 21&24 Flue sensor & ST3 4.

14 Defective hot water sensor

The resistance value measured by the hot water sensor lies outside the range of -39 and +110°C. Repair the fault and press reset. No hot water sensor present and desired value of P2 Set above zero.

15 Defective external sensor

The resistance value measured by the external sensor lies outside the range of -39 and +110°C. Repair the fault and press reset.

20/21 Fault in gas valve control system

After the burner has been switched off, an ionisation signal of more than 1μ A is still measured for 5 seconds. Repair the fault and press reset.

22 Faulty K1 Relay or associated wiring

The K1 relay (Terminals 21& 24) is not creating a continuity circuit for controller terminal ST9 1&2 to simulate a correctly operating air pressure switch. K1 coil fed from controller terminals ST11 3&4

24 Faulty minimum fan speed

During the pre purge, a specific minimum fan speed is not achieved. Repair the fault and press reset.

25 Faulty maximum fan speed

A specific maximum fan speed has been exceeded, thereby failing to meet an ignition prerequisite. Repair the fault and press reset.

26 Faulty standby fan speed

The fan speed is too high (300 rpm) when the fan is switched off. Repair the fault and press reset.

30 CRC fault in control system parameters

An EEprom fault has arisen in the stored control parameters. Check and change this parameter set.

31 CRC fault in safety-relevant parameters

An EEprom fault has arisen in the stored safety parameters. Check and change this parameter set.

32 Fault in low-voltage supply

The low voltage supply is too low, or the fuse is defective. Repair the fault and press reset.

40 Faulty K1 Relay or associated wiring

The K1 relay (Terminals 11& 14) is not creating a continuity circuit for controller terminal ST18 1&2 to simulate a correctly operating water flow switch. K1 coil fed from controller terminals ST11 3&4

X.y. Internal fault

An internal fault has been detected in the electronic system. Check and repair this safety device.

6.5 Setting into operation

1 Open the gas valve.

2 Switch on the boiler using the on/off switch on the control panel.

3 Set the type of operation to "automatic operation \bigcirc " using the "rotary selector switch". Also see the operating instructions on the boiler.

6.6 Switching-off the appliance

The appliance can be switched off in three ways:

A The boiler remains available for hot water operation. Using the "rotary selector switch", set the type of operation to:

B The boiler is out of operation and only comes into operation due to the automatic frost protection system. Using the "rotary selector switch", set the type of operation to $^{(1)}$.

- C Switch off the boiler completely.
- 1 Switch off the boiler using the on/off switch

2 Close the gas isolation valve.

6.7 Warnings

The appliance should be installed by a recognised installer.

These operating instructions should be closely followed.

If the cause of the fault cannot be determined, contact the MHS Boilers Ltd Technical Services Department.

Never carry out repairs, unless qualified to do so.

The condensate drain outlet should be removed or sealed if a boiler is shutdown during the winter,

there is a danger that the condensation may freeze.

Drain out the water using the filling and drain valve.

The user should not change anything on the appliance or the drain system.

Annual inspection and good maintenance are important for guaranteeing optimum performance.

7 Commissioning

7.1 General

The commissioning should only be done by qualified personnel. The guarantee will be void if this is not adhered to.

7.2 Commissioning

Before operating the appliance, the following should be done:

- Switch off the electrical power supply of the appliance
- Remove the case.
- Check the leak-tightness of the gas connection
- Check whether the electrical connection and the earthing have been properly installed.

Also check whether the phase (L) has been connected properly. The boiler is phase sensitive.

- Twist open the cap of the automatic air vent.
- Fill the appliance and the system with water.

- Fill the condensate bottle trap with water. The beaker on the bottom can be easily unscrewed and filled.

- Check the flue gas discharge connection and, if present, the air supply connection.
- Open the gas valve and purge the gas supply.
- Check the spark gap of the ignition electrode 4mm to the earth rod and 5mm to the burner.
- Check the gap of the rectification electrode 10mm to the burner.
- Switch on the electrical power supply of the appliance.
- Check the built in pump for free and correct rotation.
- Start the boiler

Check the boiler at full load.

Allow the boiler to run at full load and stabilise (around 3 minutes). At full load, the following settings should be checked and corrected if necessary:

Reference value for full load

Reference value for CO₂ and CO

Туре	Natural Gas	Natural Gas	Propane (G31)	Propane (G31)
	(G20) CO ₂	(G20) CO	CO ₂	СО
WM/45	8.8 %	< 75ppm	9.8%	< 100ppm
WM/65	8.8%	< 75ppm	9.8%	< 100ppm
WM/85	8.8%	< 75ppm	9.8%	< 100ppm
WM/100	9.4%	< 75ppm	10.4%	< 100ppm
WM/120	8.8%	< 75ppm	9.8%	< 100ppm

Measure the gas pressure before the gas valve. At full load, this must be at least 18 mbar for natural gas and 33 mbar for propane. If there are several boilers, this pressure should be measured with all the boilers operating at full load.

Check the water-side temperature difference (Δt) between the flow and return connections of

the boiler. The ${\mathop{ {\rm \Delta}t}}$ should be between 15 and 25 K at full load.

- Check the boiler at minimum load.

Set the boiler back to minimum load. At minimum load, the following settings should be checked and corrected if necessary:

Туре	Natural Gas	Natural Gas	Propane (G31)	Propane (G31)
	(G20) CO ₂	(G20) CO	CO ₂	СО
WM/45	8.2%	< 10ppm	9.0%	< 10ppm
WM/65	8.2%	< 10ppm	9.0%	< 10ppm
WM/85	8.2%	2% < 10ppm	9.0%	< 10ppm
WM/100	8.8%	< 10ppm	9.6%	< 10ppm
WM/120	8.2%	< 10ppm	9.0%	< 10ppm

Reference value for minimum load

Reference value for CO_2 and CO

The High fire adjustment (2) is made via a large bladed screw driver on models 45 - 100 and via a small blade screw driver on model 120. This adjuster is a non dynamic restrictor/gate and therefore should be adjusted as follows. To increase the gas throughput turn the adjuster counter clockwise. To decrease the gas throughput turn the adjuster clockwise.

The Low fire adjustment (1) is made via a 40 Torques bit on all appliances. This adjuster is a dynamic governor and therefore should be adjusted as follows. To increase the gas throughput turn the adjuster clockwise. To decrease the gas throughput turn the adjuster counter clockwise.

All adjustments must be made with the aid of a flue gas analyzer continually sampling the appliances products of combustion in the appliances flue, concentric flue adapter or where no other option is available via the flue gas sensor tapping. (in this case the probe should be inserted 2/3s of the depth of the heat exchanger.

WM 45-100







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7.3 Conversion from natural gas to propane.

For the types all WM models a throttle ring will be required for propane.

This should be installed between the gas valve and venturi. After the conversion, the CO₂ values should be set at full load and minimum load.

Туре	Diameter of throttle ring		
WM/45	6.8 mm		
WM/65	6.0 mm		
WM/85	6.0 mm		
WM/100	6.8 mm		
WM/120	8.0 mm		

- Remove the measuring equipment and re-fit the case

- The boiler is now ready for operation

8 Maintenance

8.1 Safety

Wear suitable clothing and shoes for maintenance work.

8.2 General

In order to ensure the proper and safe working of the boiler for a long period of time, it should be inspected at least once a year.

The following operations should be carried out (for a more extensive description of these operations, see 8.3):

- Replace the ignition and ionisation electrodes
- Clean the fan impeller
- Clean the primary heat exchanger with MHS Boilers Ltd WM heat exchanger cleaning granules.
- (Using only a natural bristle brush only)
- Clean the burner assembly with compressed air only. Do not brush the knitted material.
- Clean the boiler condensate bottle trap and the drain pipe
- Clean the gas filter (if fitted)
- After removing the casing, you can look at the front side with a sight glass at the ignition and combustion (flame picture)
- Test the boiler combustion for CO₂ and CO and if necessary correct the same at minimum load and at full load
- Measure the water temperature difference ${\mathop{\vartriangle}} t$ as a measure of the flow rate
- Check the water pressure
- Inspect the water quality: hardness and chloride contents
- Clean the casing on the outside and ensure that it looks clean again

8.3 Procedure

a) Switch of the electrical supply to the boiler

b) Close the gas isolating valve.

In order to carry out the following work, it is necessary to first remove the outer casing.

- The ignition and ionisation electrodes are installed on the front side of the boiler.

Remove the spark plug caps and inspect the same for possible damage such as signs of arcing and contamination (replace the same if necessary).

- If the boiler is in a dusty environment, the fan impeller may get dirty. This will reduce the air quantity delivered and may unbalance the impeller. Clean the impeller with a brush.

- Clean the heat exchanger as detailed in section 8.4

- With the burner assembly removed check and adjust where necessary the ignition electrodes spark gap (4mm to the earth rod 5 mm to the burner) and the rectification electrode gap. (10mm to the burner)

- Clean the condensate bottle trap. The bottle trap beaker can be easily unscrewed from the bottom of the boiler. Clean the same.

- Clean the gas filter (if fitted). Unscrew the bolts of the gas filter cover.

Carefully remove the filter element. Clean the filter. In the case of heavy contamination,

replace the filter. Install the filter and tighten the cover in place. Check for leakages.

- Check the combustion. Calibrated measuring equipment should be used to carry out gas, air and flue gas measurements.

8.4 Cleaning the burner and the heat exchanger

Remove the burner door assembly to gain access to the primary heat exchanger. Using a natural bristle brush remove the surface deposits. Apply the diluted WM heat exchanger cleaning granules. After a short period brush the heat exchanger once more to dislodge the more stubborn debris. Thoroughly rinse and flush the heat exchanger with clean water.

The non knit material coated burner can be cleaned on both sides with a hard brush after dismantling.

8.5 Cleaning the strainer of the gas combination block

The strainer in the gas control combination block can be cleaned. First dismantle the gas valve.

8.6 Ionisation measurement

For carrying out an ionisation measurement, a micro-ammeter with a measuring range of 0-200 μ ADC should be fitted in the ionisation circuit.

The ionisation protection can be checked in this manner. The rated ionisation signal is from 6 to 25 μ A. The minimum ionisation signal is 2.8 μ A.

8.7 Service

For service and maintenance the Technical Service Department of MHS Boilers Ltd can be contacted on 01268 546700

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9.0 Flue Terminal Positions

All measurements are in mm and are minimum clearances.

	Terminal Location	WM45 & WM65	WM85, WM 100 & WM120
Α	*Below and opening window etc.	300	600
В	Below gutter soil pipes etc.	75	700
С	Below Eaves.	200	200
D	*Below balconies or car port roof.	200	N/A
Ε	From vertical drain or soil pipe etc.	150	150
F	From internal or external corners.	300	300
G	Above ground or balcony level.	300	300 (2000 where people have general access)
н	From a surface facing the terminal.	2000	2000
I	From a terminal facing the terminal.	2000	2000
J	*From opening in a carport into a dwelling.	1200	N/A
к	Vertically from a terminal on the same wall.	1500	1500
L	Horizontally from a terminal on the same wall.	300	600
M	Above an opening, window etc.	500	600
Ν	*Horizontally to an opening, window etc.	300	600
Ρ	Above a level roof (base of terminal.)	500	500
Q	From an adjacent wall (edge of terminal.)	500	500
R	From adjacent opening, window etc.	1000	1000
S	From any other flue terminal.	600	600



Groups of appliances of 150kW gross input (136kW net input) and above must comply with the Clean Air Act with respect to the chimney discharge height.

The terminal/s shall be guarded if it is less than 2000mm above the ground or in any position where it may cause injury to persons resulting from touching a hot surface.

Document Intended for quick guidance only. Absolute guidance must be sought from the respective regulation.

Legend to Wiring Diagrams

Item #	45 – 120 Wiring Diagrams			
1	KM628 Boiler Controller			
2	Ignition Transformer			
3	Ignition Electrode			
4	Main Gas Valve			
5	Rectification Electrode			
6	BM8 Room Unit			
8	Gas Valve (1 Amp Control Fuse WM 120 Only)			
9	CXE Control Module			
19	Boiler Power Isolator			
21	DHW Sensor			
22	Outside Air Sensor			
23	Flue Gas Sensor			
24	Boiler Flow Sensor			
28	K1 & K2 Relays (Internal Control Interlocks)			
29	K4 & K5 Relays (Gas Valve Control Relays WM 120 Only)			
73	Combustion Fan Control Voltage Resistors			
78	Combustion Fan			
80	Boiler Pump (Internal WM 45 – 85 External WM 100-120)			
93	Control System Transformer			









Notes		
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