

Installation, commissioning and servicing instructions

Wall hung gas fired condensing boiler

Worcester Commercial Boiler Series

GB162-50/65/85/100 V2

For central heating systems and indirect fed domestic hot water



6720814332-0.1TD

**These appliances are for use with Natural Gas or L.P.G.
(Cat. II_{2H3P} type C₁₃, C₃₃ & C₅₃)**

	Model	GC Number
Natural Gas	50-V2	41-406-66
	65-V2	41-406-67

If you smell gas:

- ▶ Well away from the building: In Great Britain call the National Gas Emergency Service on 0800 111 999.
In Northern Ireland call 0800 002 001 and in Ireland call 1850 20 50 50
- ▶ L.P.G. boilers: Call the supplier's number on the side of the gas tank.



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1 Key to symbols and safety precautions

1.1 Key to symbols


Warnings

	Warnings in this document are identified by a warning triangle printed against a grey background. Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.
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The following keywords are defined and are used in this document:

- **NOTICE** indicates a situation that could result in damage to property or equipment.
- **CAUTION** indicates a situation that could result in minor to medium injury.
- **WARNING** indicates a situation that could result in severe injury or death.
- **DANGER** indicates a situation that will result in severe injury or death.

Important information

	This symbol indicates important information where there is no risk to people or property.
---	---

Additional symbols

Symbol	Explanation
▶	Step in an action sequence
→	Cross-reference to another part of the document
•	List entry
–	List entry (second level)

Table 1

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION.

These instructions are applicable to the Worcester appliance model(s) stated on the front cover of this manual only and must not be used with any other make or model of appliance.
These instructions apply in the UK and Ireland only and must be followed except for any statutory obligations.
This appliance must be installed by a GAS SAFE registered, competent person. Failure to install correctly could lead to prosecution.
If you are in any doubt, contact the Worcester Technical helpline(2018/04). See contact information on the back cover of these instructions.
Please leave these instructions with the completed BENCHMARK CHECKLIST, (or a certificate confirming compliance with IS 813, Eire only) and the user manual with the owner or at the gas meter after installation or servicing.
Distance learning and training courses are available from Worcester.
The BENCHMARK CHECKLIST can be found in the back of this Installation manual.

Abbreviations

∅	Diameter
NG	Natural Gas
LPG	Liquid Petroleum Gas
CH	Central Heating
DHW	Domestic Hot Water
IP	Ingress Protection
KIM	Boiler identification module
RCD	Residual Current Device
TRV	Thermostatic Radiator Valve
WRAS	Water Regulations Advisory Scheme
SEDBUK	Seasonal Efficiency of Domestic Boilers in the United Kingdom

Table 2 Abbreviations use in this manual

1.2 Safety precautions

If you smell gas

A gas leak could potentially cause an explosion. If you smell gas, observe the following rules.

- ▶ Prevent flames or sparks:
 - Do not smoke, use a lighter or strike matches.
 - Do not operate any electrical switches or unplug any equipment.
 - Do not use the telephone or ring doorbells.
- ▶ Turn off the gas at the meter or regulator.
- ▶ Open windows and doors.
- ▶ Warn your neighbours and leave the building.
- ▶ Prevent anyone from entering the building.
- ▶ Well away from the building: call the National Gas Emergency Service, see contact information on the front cover of these instructions.
- ▶ L.P.G. boilers: Call the supplier's number on the side of the gas tank.

APPLIANCE OPERATION:

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge, only if they have been given supervision or instruction concerning the use of the appliance, in a safe way, and understand the hazards involved.

Children shall not play with the appliance.

Cleaning and user maintenance shall not be made by children without supervision.



Benchmark places responsibilities on both manufacturers and installers. The purpose is to ensure that customers are

provided with the correct equipment for their needs, that it is installed, commissioned and serviced in accordance with the manufacturer's instructions by competent persons and that it meets the requirements of the appropriate Building Regulations. The Benchmark Checklist can be used to demonstrate compliance with Building Regulations and should be provided to the customer for future reference.

Installers are required to carry out installation, commissioning and servicing work in accordance with the Benchmark Code of Practice which is available from the Heating and Hot water Industry Council who manage and promote the scheme.

Visit centralheating.co.uk for more information.

HEALTH AND SAFETY

The appliance contains no asbestos and no substances have been used in the construction process that contravene the COSHH Regulations (Control of Substances Hazardous to Health Regulations 1988).

COMBUSTIBLE AND CORROSIVE MATERIALS:

Do not store or use any combustible materials (paper, thinners, paints etc.) inside or within the vicinity of the boiler.

Chemically aggressive substances can corrode the appliance and invalidate any warranty.

FITTING & MODIFICATIONS

Fitting the appliance and any controls to the appliance may only be carried out by a competent engineer in accordance with the current Gas Safety (Installation and Use) Regulations.

Flue systems must not be modified in any way other than as described in the fitting instructions. Any misuse or unauthorised modifications to the appliance, flue or associated components and systems could invalidate the warranty. The manufacturer accepts no liability arising from any such actions, excluding statutory rights.

SERVICING

Advise the user to have the system serviced annually by a competent, qualified Gas Safe registered engineer. Approved spares must be used to help maintain the economy, safety and reliability of the appliance.

IMPORTANT

The service engineer must complete the Service Record on the Benchmark Checklist after each service.

INSTALLATION REGULATIONS

Current Gas Safety (Installation & Use) Regulations:

All gas appliances must be installed by a competent person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.

The appliance must be installed in accordance with, and comply to, the current: Gas Safety Regulations, IET Regulations, Building Regulations (England), Building Standards (Scotland) (Consolidation), Building Regulations (Northern Ireland), Building Regulations (Wales), local water by-laws, Health & Safety Document 635 (The Electricity at Work Regulations 1989), EU Regulations No. 811/2013 - Energy Labelling and any other local requirements.

British Standards:

Where no specific instruction is given, reference should be made to the relevant British Standard codes of Practice.

BS5440:1 - Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Flues

BS5440:2 - Flues and ventilation for gas appliances of rated heating not exceeding 70kW (net): Air Supply

BS5546 - Installation of gas hot water supplies for domestic purposes

BS6644:2011 - Specification for the installation and maintenance of gas fired hot water boilers of rated inputs between 70kW (net) and 1.8MW (net) (2nd and 3rd family gases)

BS6798 - Installation of gas fired boilers of rated input up to 70kW (net)

BS6891 - Installation of low pressure gas pipe work up to 28mm (R1)

BS7074:1 - Code of practice for domestic and hot water supply

BS7593 - Treatment of water in domestic hot water central heating systems

EN12828 - Central heating for domestic premises

IGE/UP/10 latest edition - Installation of flued gas appliances in industrial and commercial premises

Irish Standards

The relevant Irish standards should be followed, including:

- ECTI National rules for electrical installations
- IS 813:2002 for Domestic Gas Installations.
- BS5440:2 (up to a total boiler rating of 70 kW input).
- BS6644 (Total boiler rating of 70 kW to 1.8MW input).

LPG Installations

An appliance using L.P.G. must not be installed in a room or internal space below ground level unless one side of the building is open to the ground.

Timber framed building:

Where the boiler is to be fitted to a timber framed building the guidelines laid down in BS5440: Part 1 and IGE "Gas Installations in Timber Frame Buildings" should be adhered to.

Potable water:

All seals, joints and compounds (including flux and solder) and components used as part of the secondary domestic water system must be approved by WRAS.

CH Water:

Artificially softened water must not be used to fill the central heating system.

The manufacturer's notes must not be taken, in any way, as overriding statutory obligations.

The design and construction of the Worcester Wall hung gas fired condensing boiler conforms to the basic specifications listed in the European regulation governing appliances burning gaseous fuels EU 2016/426, and with respect to EN 625, EN 483 and EN 15502.

European regulations

Number	Description
92/42/EEC	Efficiency Directive.
98/83/EC	Directive in relation to the quality of water for human consumption
2004/108/EC	EMC Directive
2006/96/EC	Low-voltage guideline
EU 2016/426	Gas Appliance Regulation
EN 437	Test gases, test pressures, appliance categories
EN 12828	Heating systems in buildings - planning hot water heating systems
EN 12831	Heating systems in buildings – process for calculating the standard heat energy demand
EN 13384	Flue systems, heat and fault calculation models
EN 15502	Gas-fired heating boilers
EN 50201-1	Boiler for gaseous fuels - Part 1: General requirements and tests
EN 50201-2-1	Boilers for gaseous fuels - Part 2-1: Type C boilers and Type B2, B3 and B5 boilers with a rated heat input no greater than 1000 kW

Table 3 European regulations, standards and guidelines

2 Appliance information

2.1 Determined use

The appliance may only be used for the heating of central heating water in a sealed system and for DHW (Domestic Hot Water) heating in closed-loop DHW and heating systems. Any other use is considered inappropriate. Any damage that may result is excluded from liability.

2.2 Declaration of Conformity

The design and operating characteristics of this product comply with the European and national requirements.

CE The CE marking declares that the product complies with all the applicable EU legislation, which is stipulated by attaching this marking.

The complete text of the Declaration of Conformity is available on the Internet (→ address on the back cover of these instructions).

2.3 Appliance types

This document refers to the following appliance types:

- GB162-50 V2
- GB162-65 V2
- GB162-85 V2
- GB162-100 V2

The designation of the boiler comprises the following:

- Worcester: manufacturer
- GB162 V2: product name
- 50, 65, 85 or 100: type name

2.4 Data plate

The data plate is on the top of the boiler to the left of the flue gas adaptor (→ figure 4, [8]). The data plate contains the serial number, gas group classification and approvals.

2.5 Scope of delivery

The boiler is supplied pre-assembled from the factory.

- ▶ Check that the delivery is complete and undamaged.

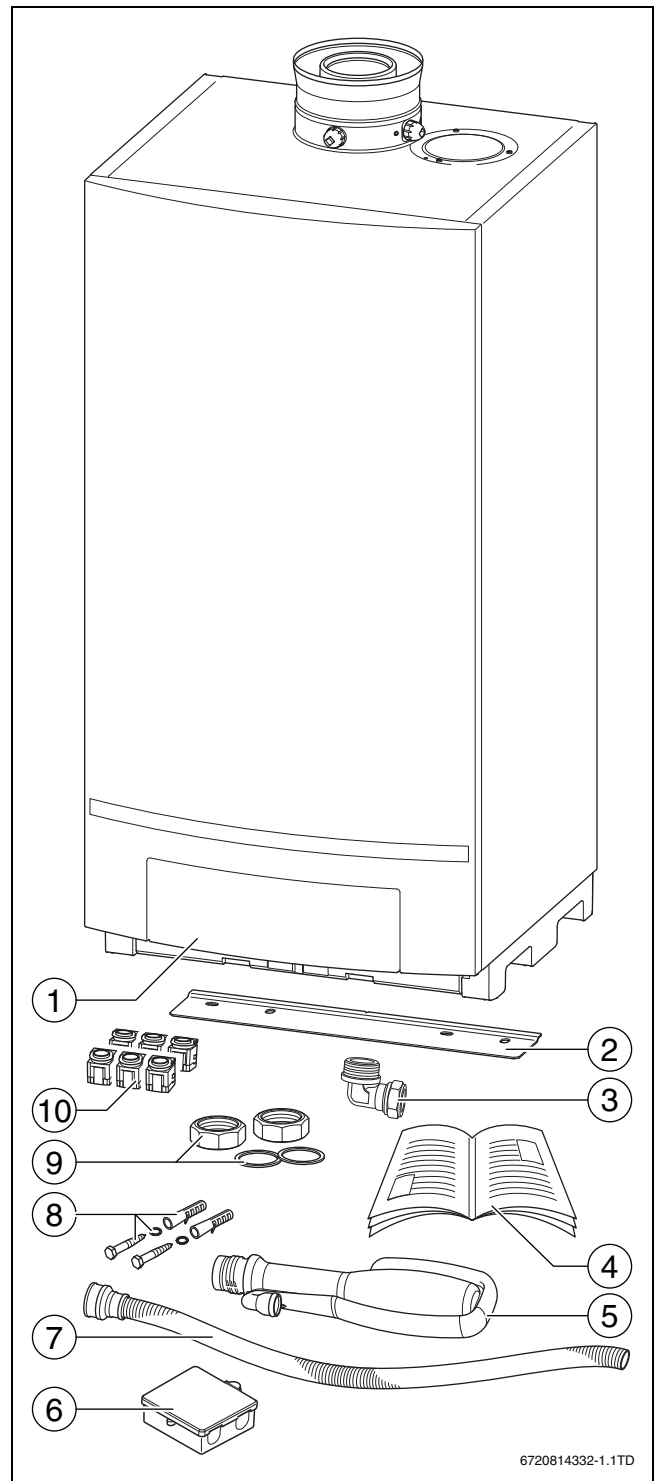


Fig. 1 Scope of delivery

- [1] Wall mounted gas condensing boiler
- [2] Mounting bracket
- [3] Compression elbow
- [4] Technical documentation
- [5] Condensate trap
- [6] RTH convertor (50-V2 and 65-V2 only)
- [7] Condensate hose
- [8] Screw, washer, rawl plug (2 ×)
- [9] Screw fitting with gasket (2 ×)
- [10] Strain relief (6 ×)

2.6 LPG conversion

This boiler is approved for the gas type specified on the data plate. If the boiler can be converted for another gas type, corresponding information will be provided in the gas data (→ chapter 2.15, page 9).

2.7 Accessories

A wide range of accessories is available for the GB162 V2 boilers. Please contact the manufacturer for further details. You will find the relevant contact details on the back cover of these instructions.

2.8 Removing the casing

- ▶ Undo locking screws [1.].
- ▶ Pull down the 2 click fasteners on the underside of the control panel down [2.].
- ▶ Remove the casing [3.].

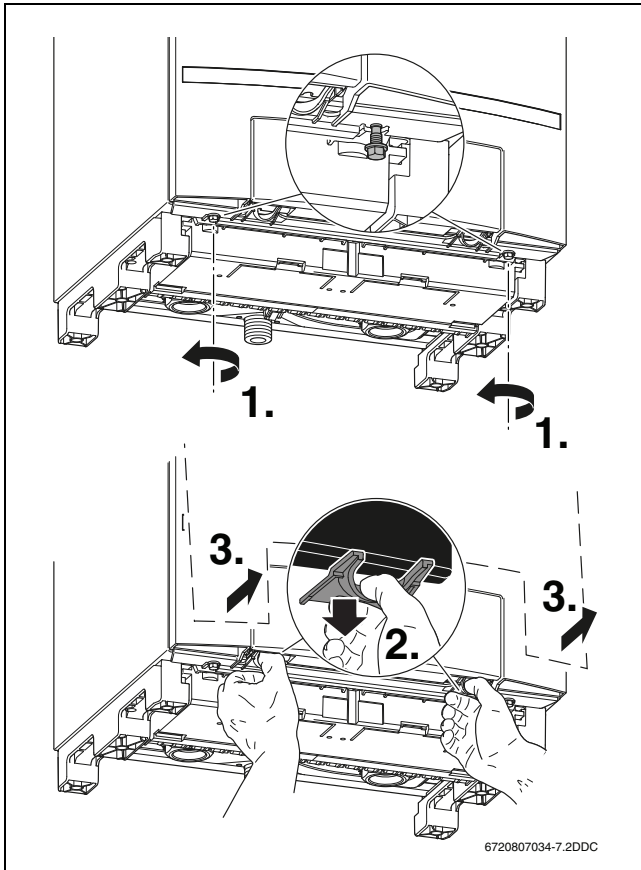


Fig. 2 Casing removal

2.9 Anti-Freeze Protection



NOTICE: System damage.

The central heating system may freeze up during severe frost due to: intermittent electricity supply, inadequate gas supply or an appliance error.

- ▶ Install the boiler in a frost-free room.
- ▶ Drain the water from the central heating system if it will be out of operation for an extended period.

The boiler is equipped with integral frost protection. This means that the boiler requires no external frost protection system. The frost protection system fires the boiler at a boiler temperature of 7 °C and will operate the circulating pump until a boiler temperature of 15 °C is reached. The boiler does not guarantee the protection of the entire heating system from frost.

2.10 Pump anti-seizure

The pump starts automatically for 10 seconds every 24 hours if the pump has not been operated during this time. This procedure prevents the pump from seizing.

2.11 Dimensions

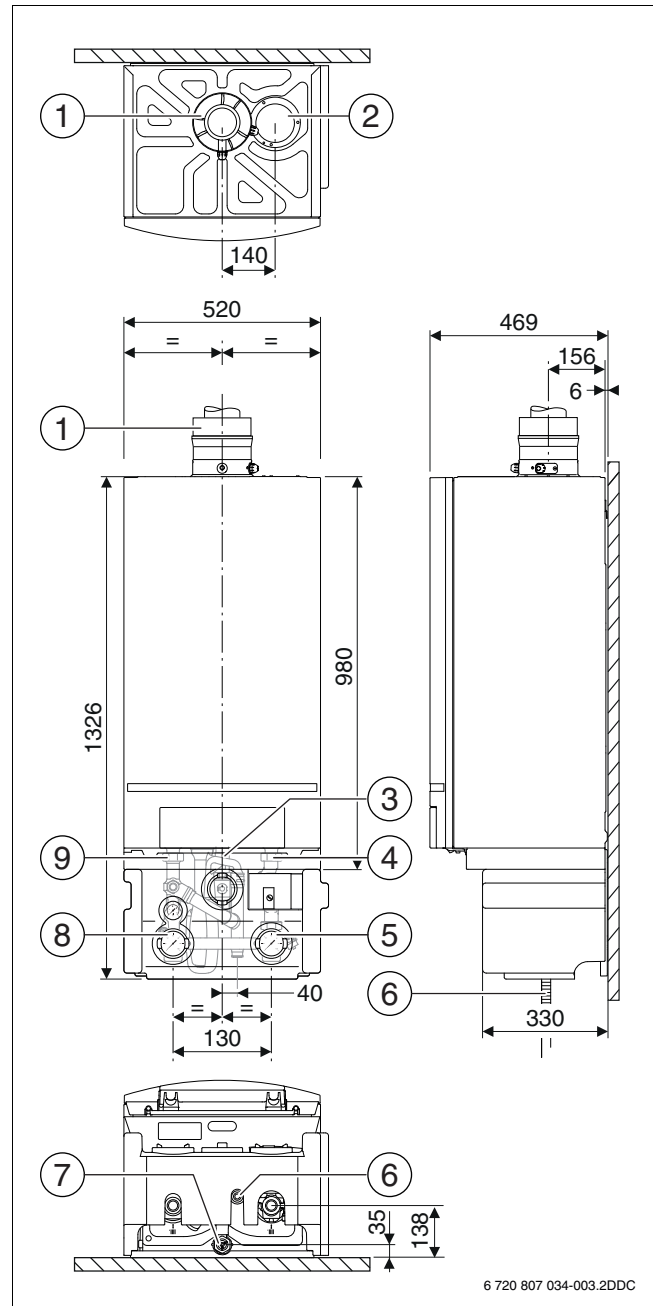
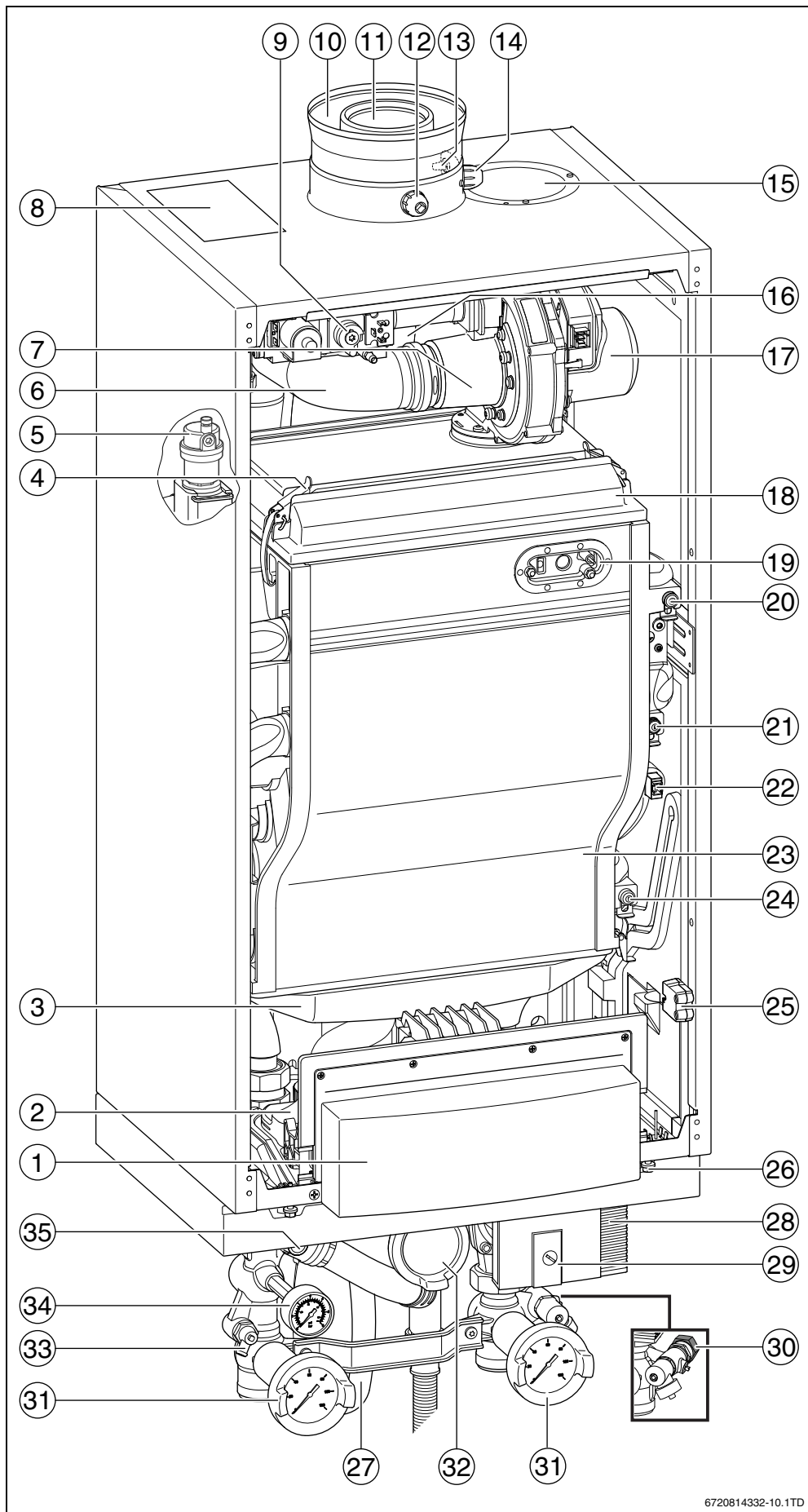


Fig. 3 Dimensions [mm]

- [1] Concentric flue, Ø 80/125 mm (50-V2 and 65-V2) or Ø 100/150 mm (85-V2 and 100-V2)
- [2] Ventilation panel
- [3] Gas connection for boiler, R 1" male thread
- [4] Heating return, G 1½" screw fitting with female thread
- [5] Pump group for return, G 1½" male thread with flat seal
- [6] Condensate pipe, Ø external diameter 24 mm
- [7] Pump group for gas connection, R 1" female thread
- [8] Pump group for flow, G 1½" male thread with flat gasket
- [9] Heating flow, G 1½" screw fitting with female thread

2.12 Product overview



Wall mounted gas condensing boiler:

- [1] Control panel
- [2] Terminal strip
- [3] Condensate sump
- [4] Burner cover release clips
- [5] Auto air vent
- [6] Air intake pipe
- [7] Venturi nozzle
- [8] Data plate
- [9] Gas valve
- [10] Combustion air connection (concentric)
- [11] Flue gas connection (concentric)
- [12] Flue gas testing point
- [13] Flue gas temperature sensor
- [14] Incoming air testing point
- [15] Cap, combustion air connection (overpressure flue)
- [16] Flue pipe
- [17] Fan
- [18] Burner
- [19] Ignition device
- [20] Flow temperature sensor
- [21] Safety temperature sensor
- [22] Pressure sensor
- [23] Heat exchanger
- [24] Return temperature sensor
- [25] Boiler ID module (KIM)
- [26] Locking screw
- [27] Condensate trap

Pump group (accessory):

- [28] Pump
- [29] Drain & fill valve (DFV)
- [30] Expansion vessel connection
- [31] Hydraulic isolation valves
- [32] Gas isolation valve
- [33] Drain cock
- [34] Pressure gauge
- [35] Pressure Relief Valve

Fig. 4 GB162 V2 with pump group

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2.13 Wiring diagram

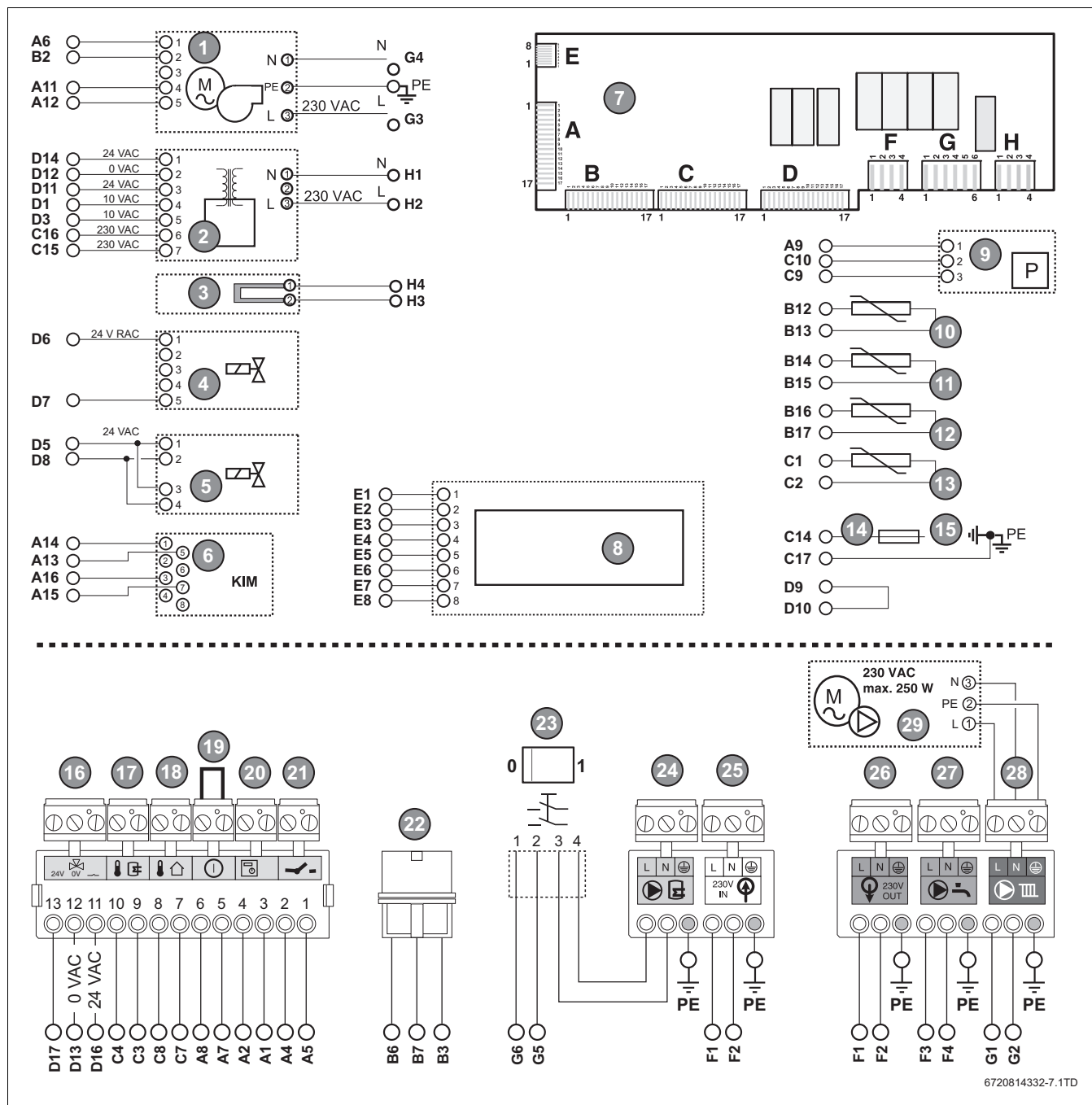


Fig. 5 Wiring diagram

- | | |
|---|--|
| [1] Fan | [16] Turquoise - no function |
| [2] Transformer | [17] Grey - no function |
| [3] Glow ignitor | [18] Blue - outside temperature sensor |
| [4] Gas valve type 50-V2 and 65-V2 | [19] Red - external switching contact (link added as standard) |
| [5] Gas valve type 85-V2 and 100-V2 | [20] Orange - modulating temperature controller |
| [6] Boiler ID module (KIM) | [21] Green - on/off room temperature-dependent controller / RTH converter (included in 50-V2 and 65-V2 delivery) |
| [7] Burner control unit | [22] Pump control signal PWM |
| [8] Control panel | [23] On/off switch |
| [9] Pressure sensor | [24] Grey - no function |
| [10] Return temperature sensor | [25] White - power supply 230 V AC, 50 Hz |
| [11] Flue gas temperature sensor (cascade flue accessory) | [26] Orange - power supply of the 1st function module 230 V AC |
| [12] Flow temperature sensor | [27] Purple - no function |
| [13] Safety temperature sensor | [28] Green - pump group or external |
| [14] Flame sense electrode | [29] Pump group, external pump 230 V AC, max. 250 W |
| [15] Earth | |

2.14 Specifications

		50-V2	65-V2	85-V2	100-V2
General Information					
	Unit				
Rated output G20 (50/30 °C) [P _{n cond}]	kW	14.3 – 49.9	14.3 – 69.5	20.8 – 84.5	20.8 – 99.5
Rated output G20 (80/60 °C) [P _n]	kW	13.0 – 46.5	13.0 – 62.6	18.9 – 80.0	19.0 – 94.5
Rated input G20 [Q _{n (Hi)}]	kW	13.3 – 47.5	13.3 – 64.3	19.3 – 82.0	19.3 – 96.5
Efficiency G20 (37/30 °C) partial load 30% in accordance with EN 15502	%	108.2	107.8	107.9	107.9
Efficiency G20 (80/60 °C) full load	%	97.7	97.4	96.7	97.0
Standby loss in accordance with EN 15502	%	0.18	0.14	0.11	0.09
Seasonal efficiency, heating curve (75/60 °C)	%	106.1	106.8	107.1	106.7
Seasonal efficiency, heating curve (40/30 °C)	%	109.2	109.4	109.7	109.5
Pump over-run time	min	5			
Residual head of fan (p _{max})	Pa	85	130	195	220
IP classification [IP rating]	IP X4D (B ₂₃ , B ₃₃ : X0D)				
Flue categorisation (according to EN 15502)	B ₂₃ , B ₃₃ , C ₁₃ , C ₃₃ , C ₄₃ , C ₅₃ , C ₆₃ , C ₈₃ , C ₉₃				
Temperature classification in accordance with EN 14471	T120				
Appliance fuse	230 V, 5AF				
Mains voltage, frequency [U]	230 V, 50 Hz				
Electrical power consumption (without a pump group), standby / partial load / full load	W	6 / 18 / 41	6 / 18 / 82	6 / 25 / 102	6 / 25 / 155
Permissible ambient temperature	°C	0 – 40			
Maximum flow temperature [T _{max}]	°C	90			
Maximum operating pressure [PMS]	bar	4			
Maximum condensate accumulation rate	l/h	6.0	7.6	9.3	11.0
Connections					
Flue gas connection/concentric air supply	mm	80/125		100/150	
Heating flow/return pipe (boiler)	inch	G 1½			
Gas connection (boiler)	inch	R 1			
Condensate drain (flexible hose external diameter)	mm	24			
Emission levels in accordance with EN 13384					
CO ₂ content with natural gas G20, partial load/full load	%	8.9 / 9.3	8.9 / 9.3	8.9 / 9.3	8.9 / 9.3
CO output G20 at full load	ppm	33	57	83	100
NO _x emission G20 at full load in accordance with EN 15502 (average)	mg/kWh	15	24	21	35
NO _x class	5				
Flue gas mass flow rate at max. rated output	g/s	22.2	29.8	37.7	43.8
Flue gas temperature at 80/60 °C, partial load/full load	°C	57 / 60	57 / 62	57 / 66	57 / 68
Flue gas temperature at 50/30 °C, partial load/full load	°C	34 / 39	34 / 39	34 / 49	34 / 53
Differential pressure gas/air (with partial load)	Pa	-5			
Dimensions and weight					
Height × width × depth	mm	980 x 520 x 465			
Height × width × depth including pump group	mm	1329 x 520 x 465			
Weight (dry)	kg	70			
Pump group					
Heating flow pipe	inch	G 1½			
Heating return pipe, male thread with flat gasket	inch	G 1½			
Gas	inch	G 1			
Electrical power consumption WILO Stratos PARA 25/1-8, min./max.	W	8 / 140			
Maximum current drawn WILO Stratos PARA 25/1-8	A	0.95			

Table 4 Specifications



The information in brackets corresponds to the information on the data plate.

2.15 Product data on energy consumption

The product data on energy consumption can be found in the operating instructions for the user.

2.16 Gas specification

Gas consumption

Gas type	Maximum gas consumption m ³ /h			
	50-V2	65-V2	85-V2	100-V2
Natural gas E, H, E _s (G20)	5.03	6.81	8.68	10.24
Propane 3P (G31)	1.80	2.48	3.19	3.76

Table 5 Gas consumption

Gas supply pressures

Country	Gas category	Gas supply pressure [mbar]		
		Min.	Rated	Max.
GB, IE	Natural gas H, G20	17 ¹⁾	20	25
GB, IE	Propane, G31 (conversion required)	25 ¹⁾	37	45

Table 6 Gas supply pressures

1) Can be reduced by 3 mbar if measured at the inlet of the gas valve.

Natural gas

Country	Gas design pressure [mbar]	Gas category	Gas family	Default setting [mbar]
GB, IE	20	2H	2H, G20	20

Table 7 Natural gas

2.17 Hydraulic resistances

	Unit	Appliance type			
		50-V2	65-V2	85-V2	100-V2
Required flow rate at $\Delta T = 20\text{ K}$	l/h	2200	3000	3600	4300
Max. flow rate at $\Delta T = 20\text{ K}$	l/h	5000			
Resistance of boiler with required flow rate	mbar	90	170	225	320

Table 8 Hydraulic resistances

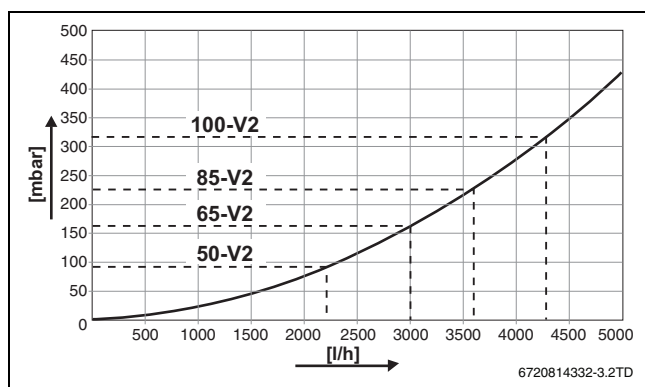


Fig. 6 Resistance graph per type

[l/h] Flow rate
[mbar] Pressure drop

2.18 Residual head

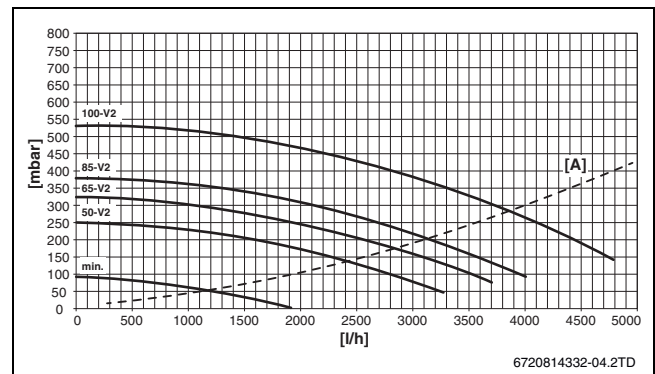


Fig. 7 Residual head per boiler type, with pump group and non-return valve

[A] Resistance of boiler
[l/h] Flow rate
[mbar] Residual head
[min.] Residual head at minimum pump speed

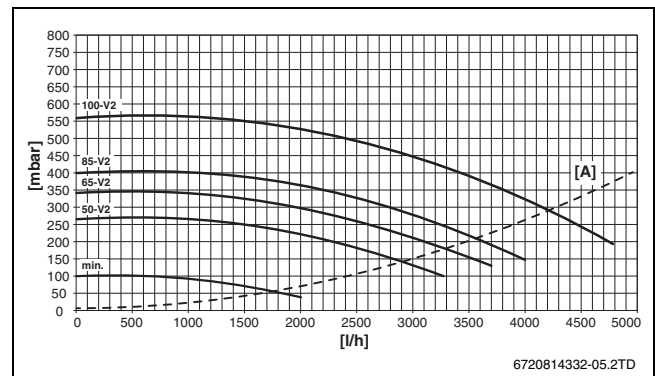


Fig. 8 Residual head per boiler type, with pump group

[A] Resistance of boiler
[l/h] Flow rate
[mbar] Residual head
[min.] Residual head at minimum pump speed

3 Pre-Installation


3.1 Cleaning primary systems

CAUTION:

- ▶ Isolate the mains supplies before starting any work and observe all relevant safety precautions. Guard against unintentional re-connection.

NOTICE:

- ▶ All the following pre-installation sections must be read and requirements met before starting the boiler or flue installations.



NOTICE:

- ▶ Debris from the system can damage the boiler and reduce efficiency.
Failure to comply with water treatment guidelines will invalidate the appliance guarantee and contravene the Building Regulations.
- ▶ It is recommended that you fit a primary water cleanser to the system. Worcester recommends a filter that will help remove both magnetite and non-magnetic debris.

Before cleaning the system:

- ▶ Ensure that the system and pipe work is in good working order.
- ▶ Where possible keep the existing boiler/circulating pump in place when flushing the system.

3.2 Water quality


Unsuitable or contaminated heating water can lead to faults in the boiler and can damage the heat exchanger, among other things, due to sludge formation, corrosion or lime scale deposits. Please get in touch with the manufacturer if you require additional information on the water quality. You will find the relevant addresses on the back cover of these instructions.

- ▶ Do not use any chemical additives (e.g. inhibitors or pH-increasing or reducing agents) other than those approved by Bosch Thermotechnology (→ table 9). The pH of the heating system water must be between 7 and 8.5. If this is not the case, please contact Worcester Customer Service before proceeding.

Product	Concentration
Fernox F1	See Fernox product data sheet
Sentinel X100	See Sentinel product data sheet

Table 9 Approved inhibitors by Bosch Thermotechnology Ltd.

3.3 Mains supply



NOTICE:
This boiler must not be connected to a 3 phase supply.

3.3.1 Electrical supply

- Supply: 230V - 50 Hz, 130 Watts
- Cable: PVC insulated H05VVf 3G1 (3 x 1mm²) temperature rated to 90 °C.
- External 3A fuse to BS1362.
- The boiler must be earthed.
- IPX4D.
- Wiring must comply with the latest edition of BS 7671 (IEE wiring regulations).

3.3.2 Gas supply

- Boilers using Natural Gas (NG) must be connected to a governed meter.
- Liquid Petroleum Gas (LPG) must be connected to a regulator.
- Installation and connection of the gas supply to the appliance must be in accordance with BS6891 or IGE/UP/2 as appropriate.
- Gas pipe sizing should be calculated to ensure no more than the permitted pressure drop between the meter/governor to the appliance inlet (→ Commissioning section).
- The meter or regulator and pipe work to the meter must be checked, preferably by the gas supplier.
- This is to ensure that the equipment is in good working order and can meet the gas flow and pressure requirements, in addition to the demand from any other appliance being served.

3.4 Water systems and pipe work

If the boiler is used in heating systems with natural water circulation or open systems (where heating water is in contact with outdoor air):

- ▶ Install a system separation solution (a plate heat exchanger for example) between the boiler and the heating system

If plastic pipes are used in the heating system, with an underfloor heating system for example,

- ▶ use plastic pipes with sufficient oxygen diffusion resistance

-or-


- ▶ Install a system separation solution (a plate heat exchanger for example) between the boiler and the heating system.

Plastic pipe work:

- Any plastic pipe work must have a polymeric barrier with 600mm (minimum) length of copper pipe before being connected to the boiler.
- Plastic pipe work used for underfloor heating must be correctly controlled with a thermostatic blending valve limiting the temperature of the circuits to approximately 50°C.


Primary systems connections/valves:

- All system connections, taps and mixing valves must at least be capable of sustaining a pressure equal to the opening pressure of the PRV used.
- Radiator valves should conform to BS2767:10.
- All other valves should conform to BS1010.
- Thermostatic radiator valves (TRV's) must be fitted to all rooms except bathrooms and the room in which the room thermostat is fitted.
- A drain cock is required at the lowest point(s) in the system.
- An air vent is required at the high point(s) in the system.



An external automatic bypass should be used if the system flow can be significantly adjusted or stopped by zone valves and thermostatic radiator valves (TRV).

Sealed primary system:



NOTICE:
Artificially softened water must not be used to fill the central heating system.

- The CH sealed system must be filled using a WRAS approved filling method or comply with figure 10 for system fill.
- An expansion vessel must be fitted as close as possible to the appliance in the central heating return. When a pump group is used, see Chapter 5.11.
- Do not use galvanised pipes or radiators.

System fill:

Filling and refilling of the heating circuit must have been carried out by a method that has been approved by the Water Regulation Advisory Scheme (WRAS), for the type of heating appliances, i.e. Domestic (in-house) Fluid Category 3. Non-Domestic (other than in-house) Fluid Category 4. Depending on the Fluid Category the approved method should comprise of the following:

Requirements Fluid Category 3 systems

- Control valve (stop valve) including a double check valve on the mains cold water supply pipe.
- Temporary connection to be removed after filling (filling loop).
- Control valve (stop valve) on the heating system pipework.

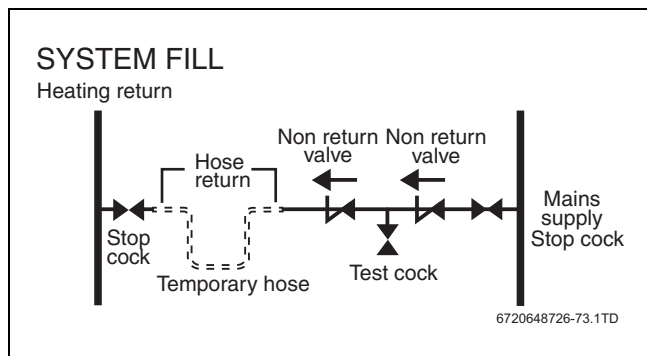


Fig. 9 System fill - category 3

Requirements Fluid Category 4 systems:

- Control valve (stop valve) on the mains cold water supply pipe.
- Strainer.
- Water non-return valve with reduced pressure Zone (RPZ valve assembly) incorporating a Type BA air gap.
- Tundish.
- Control valve (stop valve) on the heating system pipework.

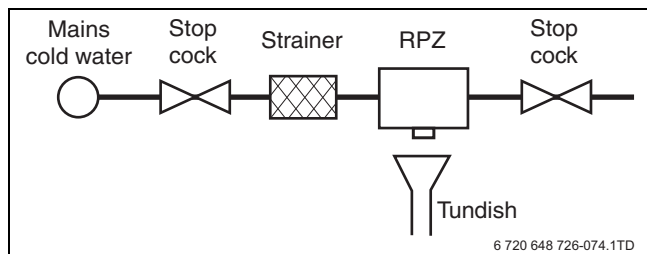


Fig. 10 System fill - category 4

Typical sealed system

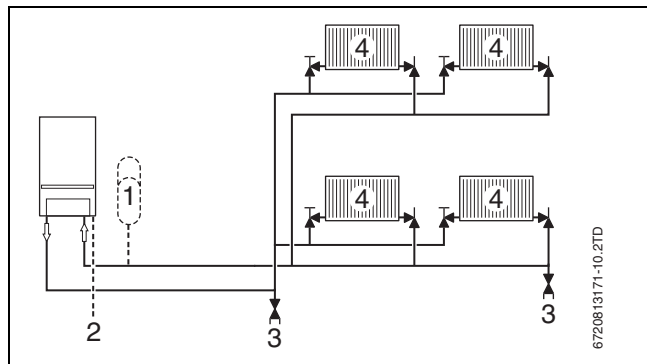


Fig. 11 Sealed system

- [1] Expansion vessel - CH return
- [2] Pressure relief discharge
- [3] Drain cock
- [4] Radiators

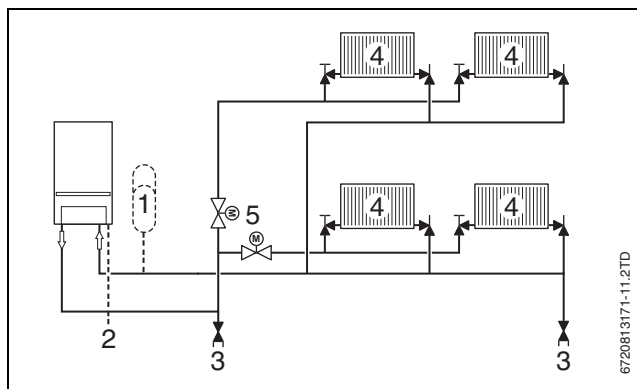


Fig. 12 Sealed system with zone valves

- [1] Expansion vessel - CH return
- [2] Pressure relief discharge
- [3] Drain cock
- [4] Radiators
- [5] Zone valves

3.5 Condensate pipe work

NOTICE:

- ▶ Where a new or replacement boiler is being installed, access to an internal "gravity discharge" point should be one of the factors considered in determining boiler location.
- ▶ The condensate pipe must be nominally 22mm Ø plastic pipe.
- ▶ The condensate pipe work must fall at least 52mm per metre towards the outlet and should take the shortest practicable route.
- ▶ Ensure there are no blockages in the pipe run.

Key to condensate illustrations	
1	Condensate discharge from boiler
2	Soil and vent stack
3	Minimum 450mm and up to three storeys
4	Visible air break at plug hole
5	Sink or basin with integrated overflow
6	75mm sink waste trap
7	Condensate pump
8	PVCu strap on fitting
9	100mm Ø minimum plastic pipe
10	Drainage holes
11	Limestone chippings
12	Bottom of sealed tube
13	Insulate and increase pipe size
14	Pipe work transition
15	External air break
16	Air gap
17	External rain water pipe into foul water
18	43mm 90° male/female bend
*	Condensate trap of 75mm already incorporated into the boiler

Table 10

3.5.1 Internal connections

In order to minimise risk of freezing during prolonged cold spells, the following methods of installing condensate drainage pipe should be adopted, in order of priority.

Wherever possible, the condensate drainage pipe should be routed and terminated so that the condensate drains away from the boiler under gravity to a suitable internal foul water discharge point such as an internal soil and vent stack. A suitable permanent connection to the foul waste pipe should be used.

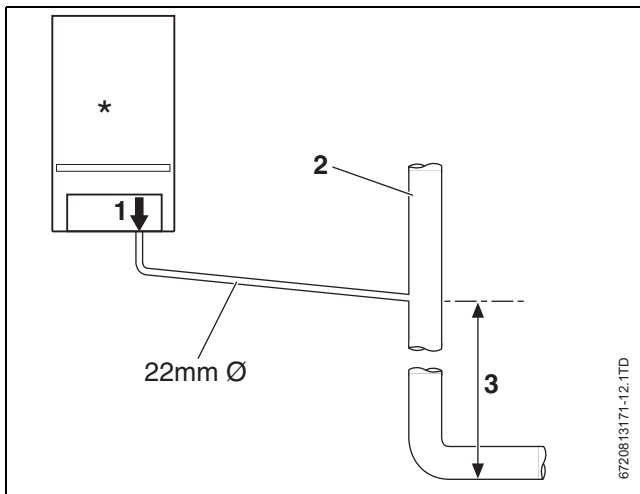


Fig. 13 Disposal to soil vent stack

Alternatively if the first option is not possible an internal kitchen or bathroom waste pipe, washing machine waste pipe etc. can be used. Ensure that the condensate drain pipe is connected “down stream” of the waste trap.

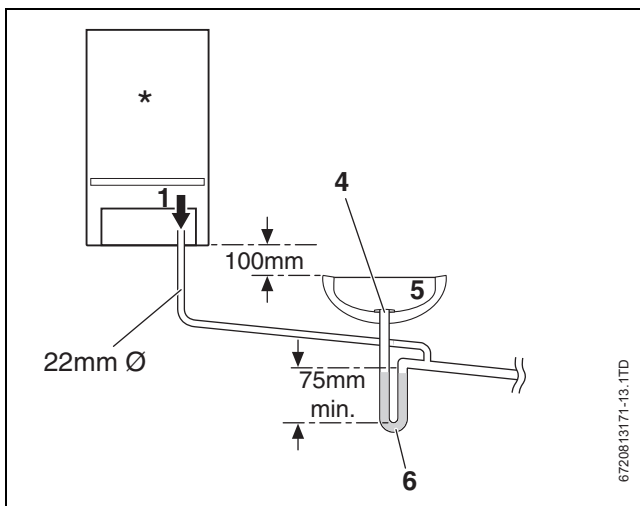


Fig. 14 Disposal to a waste pipe

- [1] Condensate discharge from boiler
- [4] Visible air break at plug hole
- [5] Sink or basin with integrated overflow
- [6] 75mm sink waste trap

Condensate pump

Where “gravity discharge” to an internal termination is not physically possible, or where very long internal runs would be required to reach a suitable discharge point, condensate should be removed using a proprietary condensate pump, of a specification recommended by the boiler or condensate pump manufacturer.

The pump outlet pipe should discharge to a suitable internal foul water discharge point such as an internal soil and vent stack, internal kitchen or bathroom waste pipe, washing machine waste pipe etc. A suitable permanent connection to the foul waste pipe should be used.

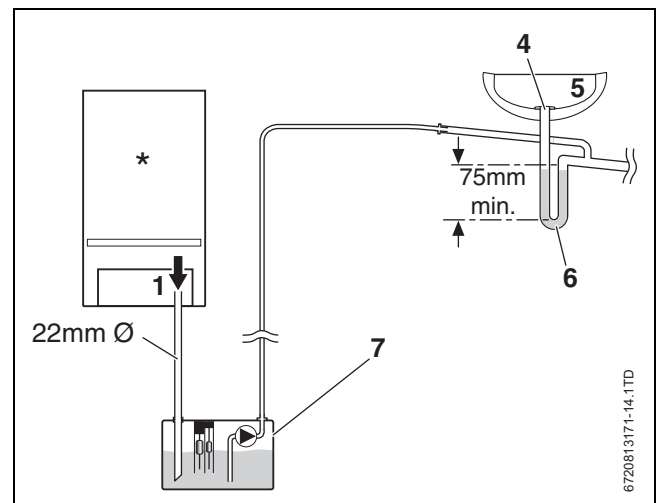


Fig. 15 Condensate pump disposal

- [1] Condensate discharge from boiler
- [4] Visible air break at plug hole
- [5] Sink or basin with integrated overflow
- [6] 75mm sink waste trap
- [*] Condensate trap of 75mm already incorporated into the boiler

3.5.2 External connections

NOTICE: Freezing conditions

- ▶ Pipe work length should be kept to a minimum and the route as vertical as possible.
- ▶ Weather proof insulation must be used.

NOTICE: Condensate waste

- ▶ Care should be taken when siting a soak-away to avoid obstructing existing services.

If no other discharge method is possible then the use of an externally run condensate drainage pipe terminating at a suitable foul water discharge point, or purpose-designed soak away, may be considered. If this method is chosen then the following measures should be adopted:

- ▶ The external run be kept as short as possible and not exceed three metres.
- ▶ The pipe should be run internally as far as possible before going externally and the pipe diameter should be increased to 32mm before it passes through the wall to the exterior. The pipe should be insulated using suitable waterproof and weather resistant insulation.
- ▶ The external pipe should take the shortest and least exposed route to the discharge point, and should “fall” as steeply as possible away from the boiler, with no horizontal runs in which condensate might accumulate.
- ▶ The use of fittings, elbows etc. should be kept to a minimum and any internal “burrs” on cut pipe work should be removed so that the internal pipe section is as smooth as possible.

Fitting an external air break

- Refer to figure 16 when a rain water down pipe is used to dispose of condensate.
- An air break must be installed in the 43mm pipe work, between the boiler condensate outlet and the drainpipe, outside the property, to avoid flooding during adverse weather conditions.

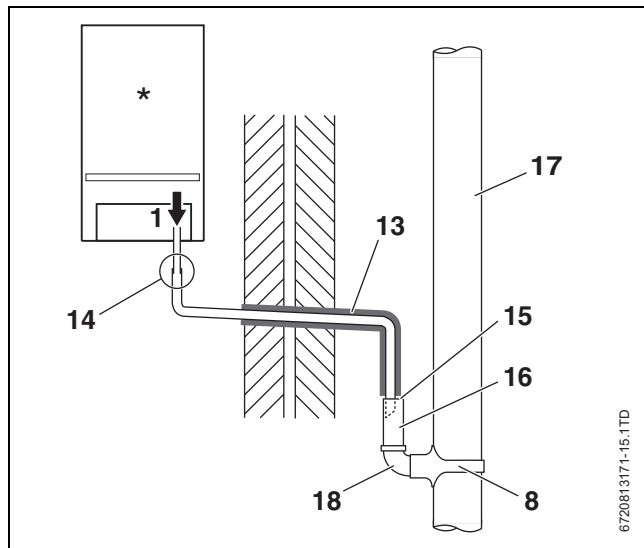


Fig. 16 Disposal into a rainwater down pipe

- [1] Condensate discharge from boiler
- [8] PVCu strap on fitting
- [14] Pipe work transition
- [15] External air break
- [16] Air gap
- [17] External rain water pipe into foul water
- [18] 43mm 90° male/female bend
- [*] Condensate trap of 75mm already incorporated into the boiler

 Condensate drainage pipe can be run above or below ground.

Where the pipe terminates over an open drain or gully, the pipe should terminate below the grating level, but above water level, in order to minimise "wind chill" at the open end.

The use of a drain cover (such as those used to prevent blockage by leaves) may offer further protection from wind chill.

Pipe drainage will be improved if the end is cut at 45° as opposed to a straight cut.

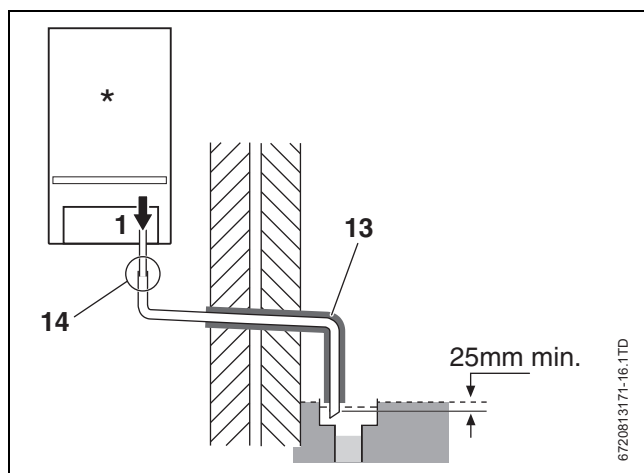


Fig. 17 External disposal

- [1] Condensate discharge from boiler
- [13] Insulate and increase pipe size
- [14] Pipe work transition
- [*] Condensate trap of 75mm already incorporated into the boiler

Condensate soak away

- The condensate drainage pipe may be run above or below the ground to the soak away. The examples shown on this page run above ground.
- The soak away must use a 100mm Ø plastic tube with two rows of three 12mm holes on 25mm centres and 50mm from the bottom of the tube. The holes must face away from the house.
- The tube must be surrounded by at least 100mm of limestone chippings to a depth of 400mm.



Minimum hole size for the condensate soak away must be 400mm deep by 300mm Ø.

In situations where there are likely to be extremes of temperature or exposure, the use of a proprietary trace-heating system for external pipe work, incorporating an external frost thermostat, should be considered. If such a system is used, the requirement to use 32mm pipe does not apply. However, all other guidance above and the instructions for the trace heating system, should be closely followed.



NOTICE: Unheated internal areas.

- ▶ Internal pipe runs in unheated areas such as lofts, basements and garages should be treated as external runs.

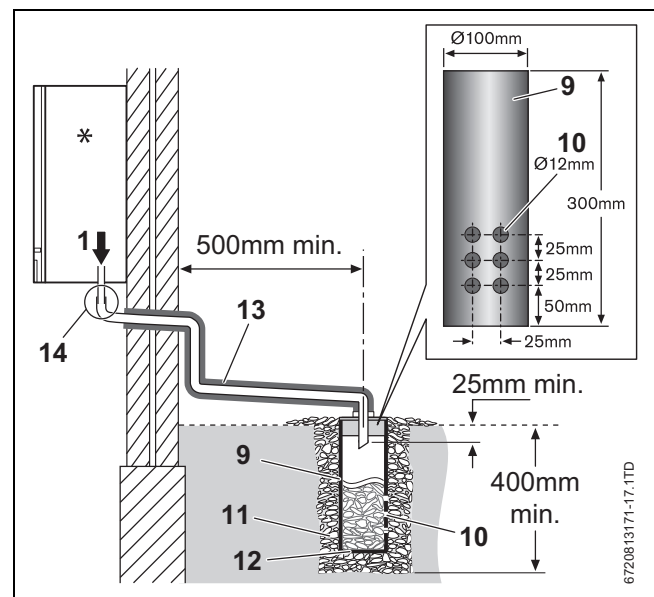


Fig. 18 Soak away

- [1] Condensate discharge from boiler
- [9] 100mm Ø minimum plastic pipe
- [10] Drainage holes
- [11] Limestone chippings
- [12] Bottom of sealed tube
- [13] Insulate and increase pipe size
- [14] Pipe work transition
- [*] Condensate trap of 75mm already incorporated into the boiler

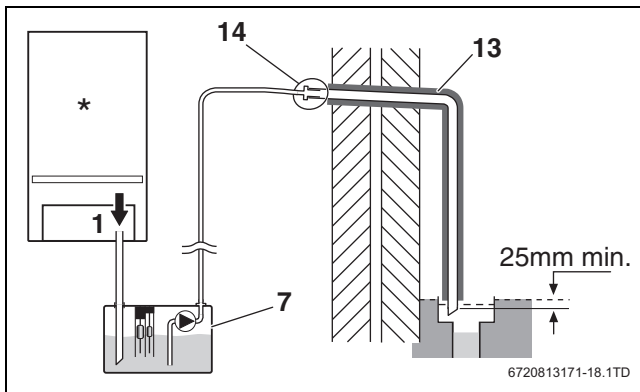


Fig. 19 Condensate pump to external disposal

- [1] Condensate discharge from boiler
- [7] Condensate pump
- [13] Insulate and increase pipe size
- [14] Pipe work transition
- [*] Condensate trap of 75mm already incorporated into the boiler

3.6 Pressure relief pipe work



NOTICE:

- ▶ The pressure relief valve is a safety device for the boiler and if activated may discharge boiling water or steam through the relief valve drain pipe.
- ▶ Care should be taken when siting the outlet pipe so that it does not cause an obstruction or discharge above a window, entrance or other public access where it could cause a hazard.

- The pressure relief drain pipe (1) from the boiler should be the same diameter as the outlet of the safety valve, copper pipe, and run downwards, away from any electrical equipment or other hazard, preferably to an external drain or soak away.
- In domestic installations pressure relief drain pipe (1) should be finished with a partial bend, near the outlet to face the external wall (as shown) to help prevent freezing.
- In commercial installations an internal drain in the plant room can be used for both the pressure relief and condensate discharge.

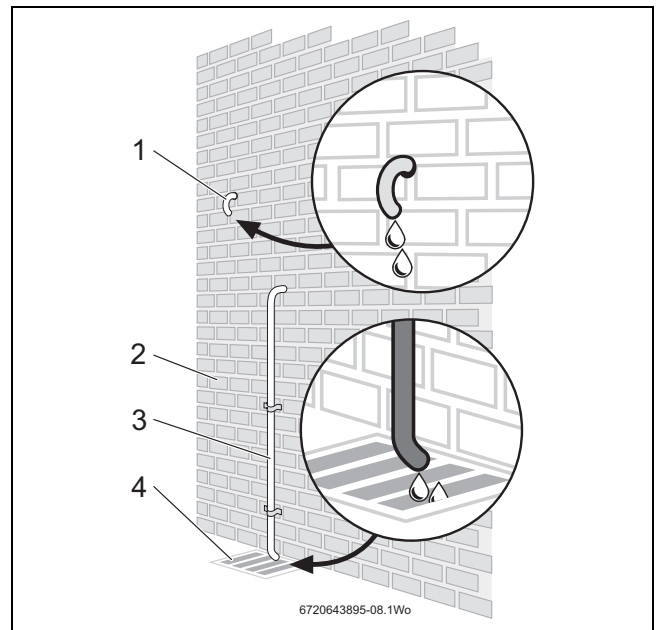


Fig. 20 Pressure relief pipe work

- [1] Drain pipe
- [2] Outside wall
- [3] Drain pipe
- [4] External drain

Combined PRV and condensate

The PRV and condensate discharge can be combined by the installer on the 50kW and 65kW models only according to BS 6798. However, care must be taken to ensure that an air gap is present between the PRV discharge pipe and the connection to the condensate discharge pipe. This is to guard against any potential blockage of the PRV, for example, frozen condensate.

If the system pressure exceeds the maximum pressure this will result in the volume of water being discharged through the PRV to be greater than the storage capacity of condensate pumps.

DO NOT fit a condensate pump when combining the PRV and condensate.

3.7 Boiler location and clearances

3.7.1 Installation and servicing clearances

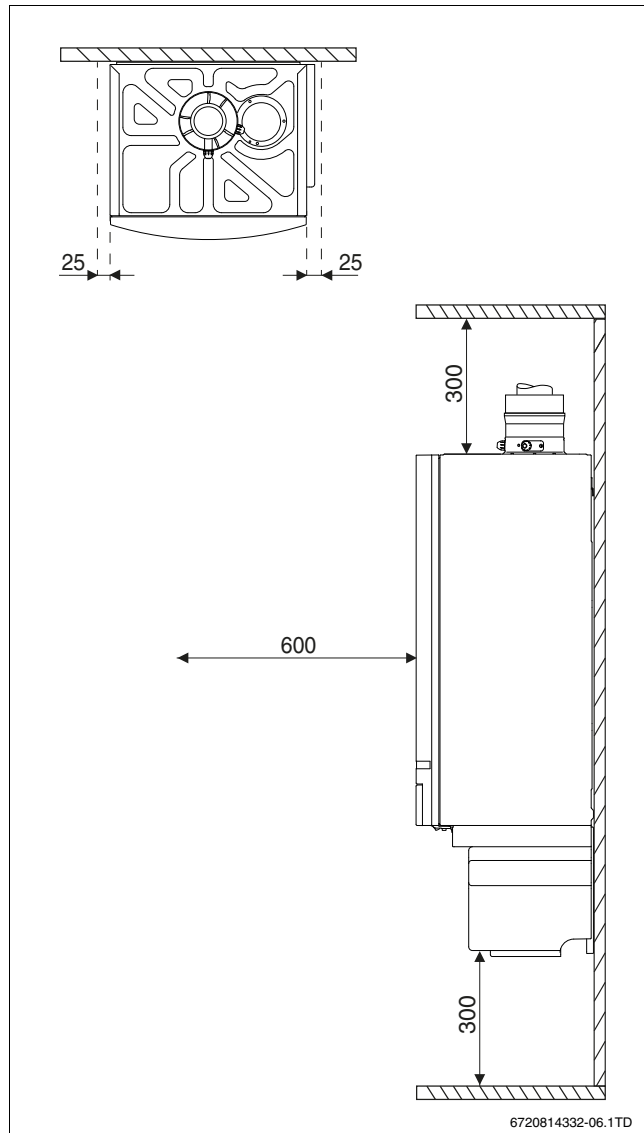


Fig. 21 Clearances [mm]

3.7.2 Compartments

Follow the requirements of BS6798 and BS5440 Part 2 and note:

- Minimum clearances must be maintained.
- If fitting the appliance into an airing cupboard use a non-combustible material to separate the appliance from the airing space. The material can be perforated up to a maximum hole size of 13mm.
- An access door is required to install, service and maintain the appliance and any ancillary equipment.

3.7.3 Bathrooms

If the boiler is fitted in bathrooms, additional RCD (Residual Current Device) protection may be required.

Consult the latest version of BS7671 (IEE wiring regulations).

3.8 Flue options



CAUTION: in domestic installations

- ▶ Where a flue system is not going to be accessible, provision must be made for service and inspection.
- ▶ Voids containing concealed flues must have at least one inspection hatch no less than 300mm square.
- ▶ Flue joints within the void must not be more than 1.5 metres from the edge of the inspection hatch.
- ▶ Inspection hatches should be located at changes of direction.
- ▶ If this is not possible, bends should be viewable from both directions.



Groups of appliances with net input in excess of 333kW must comply with the Clean Air Act by application to the Local Building control department for flue termination approval. Horizontal terminations above 333kW net input are not permitted (→ IGE/UP/10 latest edition for full guidance.)

Horizontal terminations above 70kW net input must comply with the risk assessment appendix 9 of IGE/UP/10 as well as the general requirements of IGE/UP/10.

3.8.1 Air supply and flue gas exhaust in a room sealed installation

A ventilation cover is integrated into the boilers. This cover houses a number of components, such as the burner and the heat exchanger. Since this ventilation cover is part of the air supply system, it is vital that it is always installed correctly.

To ensure optimal operation, the appliances should be connected to a Worcester horizontal or vertical flue terminal. These terminals have been developed specifically for Worcester condensing gas boilers and have been comprehensively tested for trouble free operation when correctly installed. These boilers are also compatible with third party flues if required.

Standard horizontal flue pack (→ fig. 22) for 50-V2 and 65-V2:

- 1: Flue turret 80/125;
- 2: Horizontal flue terminal 80/125;
- 3: Flue finishing kit.

Standard horizontal flue pack (→ fig. 22) for 85-V2 and 100-V2:

- 1: Flue turret 100/150;
- 2: Horizontal flue terminal 100/150;
- 3: Flue finishing kit.

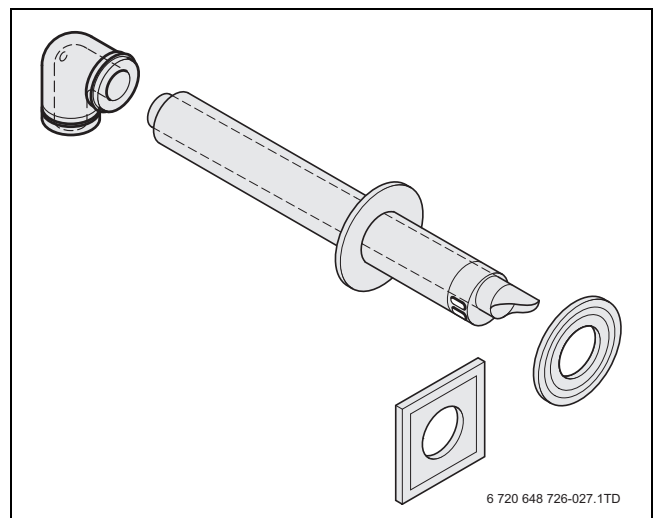


Fig. 22 Standard horizontal flue pack

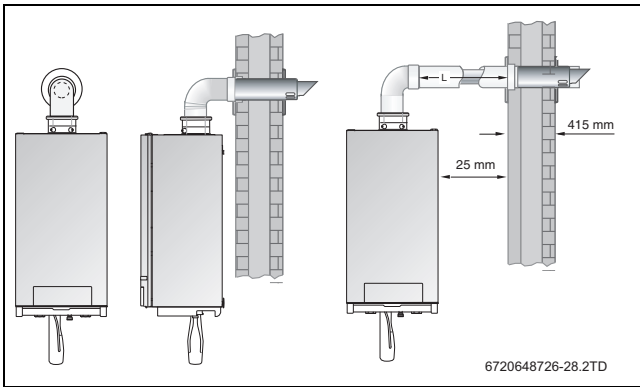


Fig. 23 Side flue and rear flue installation

Standard vertical flue pack (→ fig. 24) for 50-V2 and 65-V2:

- Concentric vertical flue pipe 80/125;
- Wall clamp.

Standard vertical flue pack (→ fig. 24) for 85-V2 and 100-V2:

- Concentric vertical flue pipe 100/150;
- Wall clamp.

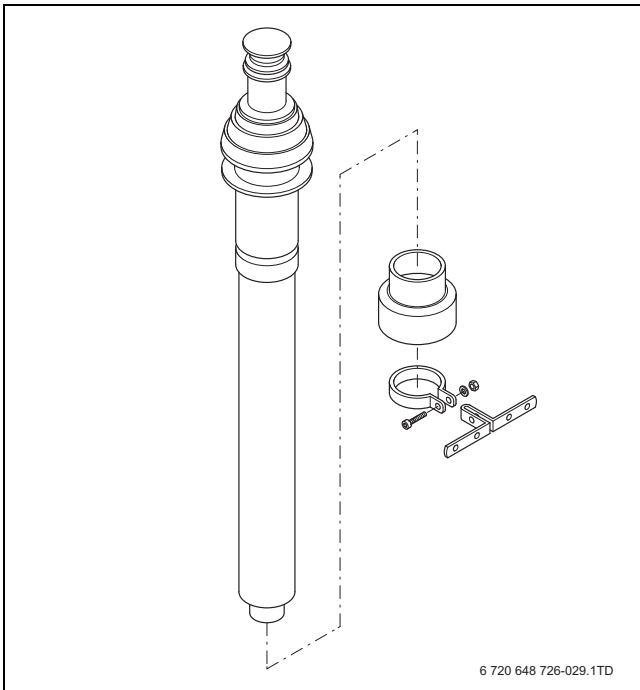


Fig. 24 Standard vertical flue pack

3.8.2 Maximum Flue length (L)

The maximum pipe length (L) of the flue run is determined by the total pressure loss of all components in the flue system.

Maximum length of horizontal or vertical extensions for 80/125 and 100/150 flue system (→ fig. 25 and fig. 26). For flue length see table 11.

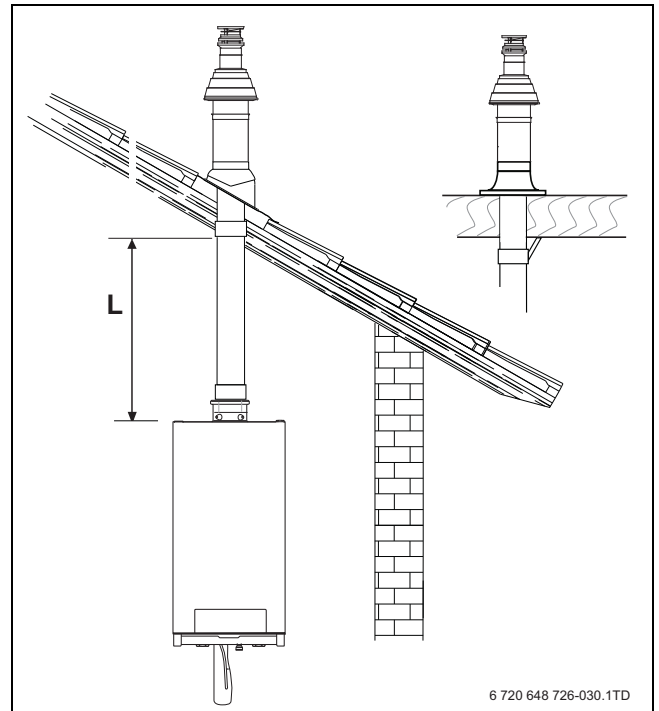


Fig. 25 Vertical flue length

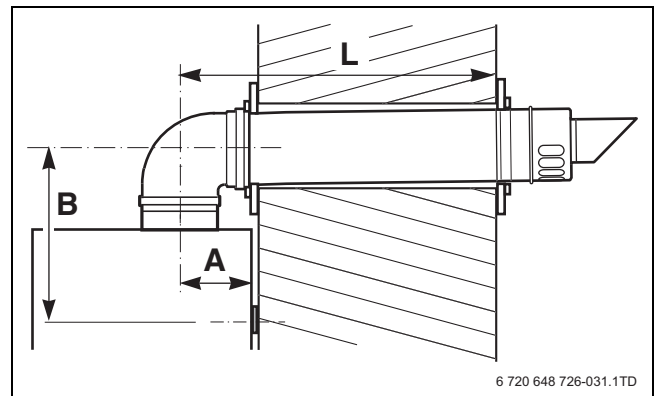


Fig. 26 Horizontal flue length

[A] Distance from centre of flue to inside rear wall

[B] Distance from centre wall bracket to centre of flue elbow

[L] Distance from centre of flue to outside wall

Take the flue pipe clearances into account when installation the installation location.

Maximum wall thickness without extensions is 415 mm. Maintain a minimum side clearance of 25 mm (→ fig. 23).

3.8.3 Additional flue parts

The additional flue parts listed can be ordered from your chosen heating merchant.

Flue size 100/150 and 80/125

Model	Maximum flue length [m] concentric flue system	
	100/150 mm	80/125 mm
50-V2	20	7.7
65-V2	20	7.7
85-V2	18	–
100-V2	18	–

Table 11 Max. flue lengths, incl. wall/roofterminal in metres

Model	Reduced flue length [m] ¹⁾							
	concentric flue system 100/150 mm				concentric flue system 80/125 mm			
	bend		extension		bend		extension	
	45°	90°	0.5m	1m	45°	90°	0.5m	1m
50-V2	1.2	2.1	0.5	1.0	0.9	1.9	0.5	1.0
65-V2	1.2	2.1	0.5	1.0	0.9	1.9	0.5	1.0
85-V2	1.2	2.1	0.5	1.0	-	-	-	-
100-V2	1.2	2.1	0.5	1.0	-	-	-	-

Table 12 Reduced flue lengths in metres

1) For every bend or extension the max. flue length (L) has to be reduced by the corresponding length in m.



The total reduction length must never exceed the maximum flue length.

Weathering slates for 80/125 and 100/150

Flat roof, pitched roof.

3.8.4 Standard 100 mm flue systems

The standard concentric flue system provides for a max. horizontal straight length (→ table 11, subsection 3.8.3). Full instructions for fitting this flue are in subsection 3.8.5: "Installation of the horizontal flue" on page 18.



Important: Any horizontal flue system fitted to a condensing boiler must be declined towards the appliance at an angle of 53 mm per metre length to prevent condensate dripping from the flue terminal. This means that the clearance above the appliance must factor in the horizontal flue run length. See fig. 21 on page 16.

3.8.5 Installation of the horizontal flue

The standard flue is suitable for lengths up to 660 mm (→ fig. 27). For longer flue runs up to 20.0 m for the 100/150 flue system and 7.7 m for the 80/125 flue system, flue extensions are available.

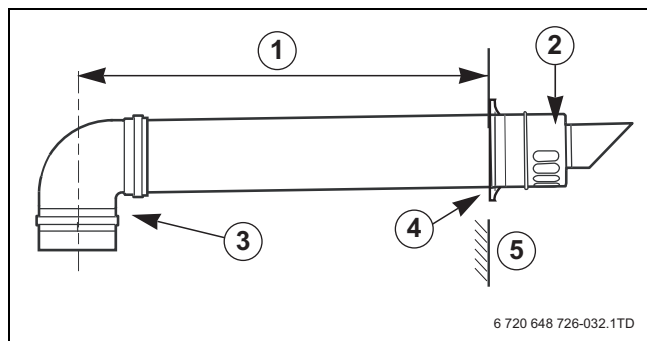


Fig. 27 Installation with horizontal flue kit

- [1] maximum length
- [2] terminal assembly
- [3] 90° flue turret
- [4] finishing kit
- [5] outer wall

3.8.6 Flue pipe preparation and assembly

► Measure the flue length L. Refer to figures 28 and 29.

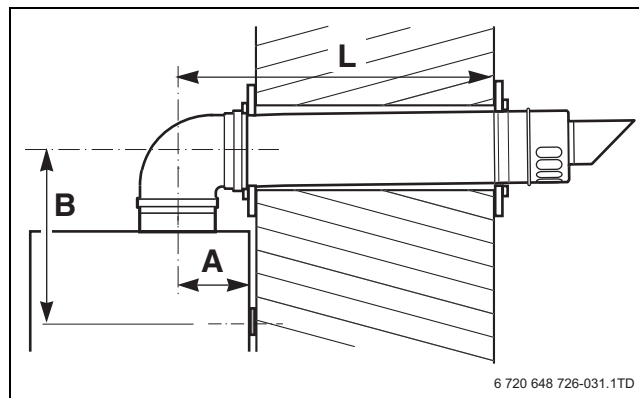


Fig. 28 Flue length - rear

- [A] 152 mm
- [B] 337.5 mm for Ø 80/125 mm horizontal flue
339.5 mm for Ø 100/150 mm horizontal flue
- [L] flue length

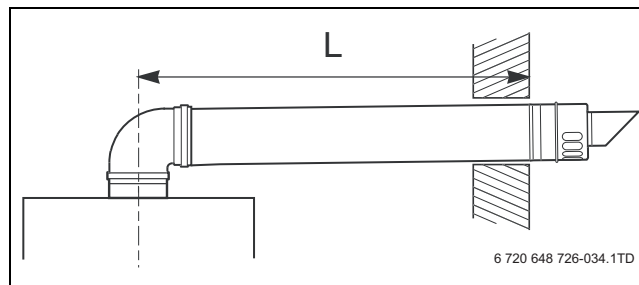


Fig. 29 Flue length - side



The flue must be inclined from the boiler.

- For connection into the elbow, a minimum length of pipe must be maintained.
The flue gas pipe (inner pipe) and air intake pipe (outer pipe) must maintain different lengths:
Air intake = L minus 50mm
Flue gas = L minus 70mm
Mark off the lengths and cut to length. The cuts must be square and free from burrs.
- Assemble flue system completely. Push the flue fully together. The slope of the terminal outlet [2] must face downwards. The assembly will be made easier if a solvent free grease is lightly applied to the male end of the flue.

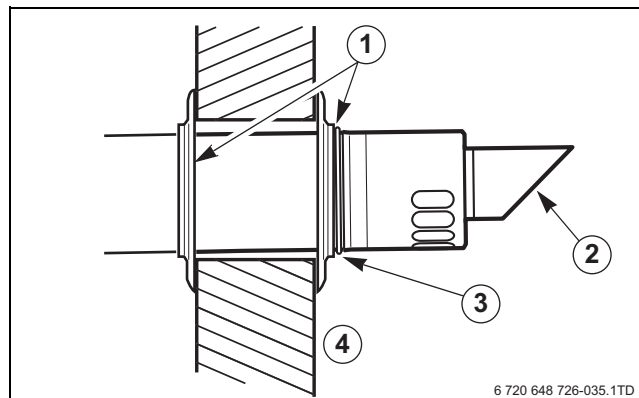


Fig. 30 Flue terminal position



An inner flue finishing kit [1] is provided which should be fitted to the ducts before assembly.

- ▶ Push the assembly through the wall and slide the terminal onto the flue connector. Ensure that the terminal is fully entered into the socket on the boiler.
- ▶ From the outside fix the flue finishing kit to the terminal and, after ensuring the flue is properly inclined towards the boiler, fix the finishing kit to the wall. If the terminal is within 2 m of the ground where there is access then an approved terminal guard must be fitted. The guard must give a clearance of at least 50 mm around the terminal and be fixed with corrosion resistant screws.

3.9 Flue gas connection

3.9.1 Open flue operation

If room-sealed fluing is not desired or possible due to local conditions, the boiler can be set up for operation to take air for combustion from the room in an open flue arrangement (contact Worcester Technical team for advice).

The boiler is factory-fitted with a concentric connection.

An air intake strainer basket can be used for open flue operation. This prevents ingress from entering the boiler (contact Worcester Technical; accessory).

3.9.2 Room sealed operation

The boiler can be connected to a concentric flue gas system.

The boiler is factory-fitted with a concentric connection.

3.9.3 Flue material

When using 3rd party plastic flue material, PPS is recommended.

3.9.4 Calculating the air intake and flue gas pipe dimensions

The total reduced pipe length is calculated from the sum of the reduced length of the horizontal and vertical flue ducting and elbows (→ table 12).

The total reduced flue length must be less than the maximum allowable flue length (→ table 11).

See also the next example.

Example of a flue design calculation for concentric flue system 100/150 using equivalent length method

Boiler: GB162-85 V2

Flue system: concentric 100/150

Maximum length: 18 m.

Here we have:

- 4 metre pipe (2 x 2 m) 4.0 m
- 2 x 90° bends (2 x 2.1 m) 4.2 m

The total length of this flue system = 8.2 m

Sum of length (8.2 m) < maximum length (18 m) → acceptable flue length.

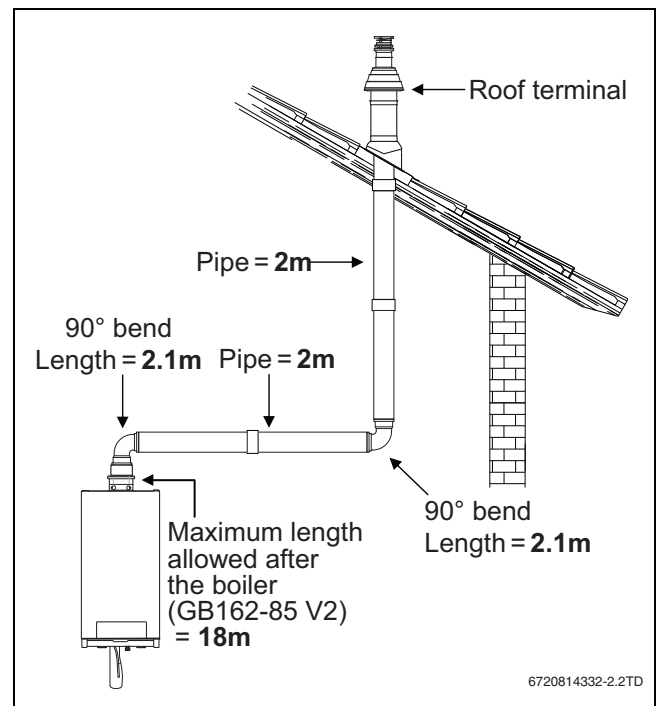


Fig. 31 Example 1

3.10 Flue terminal positions

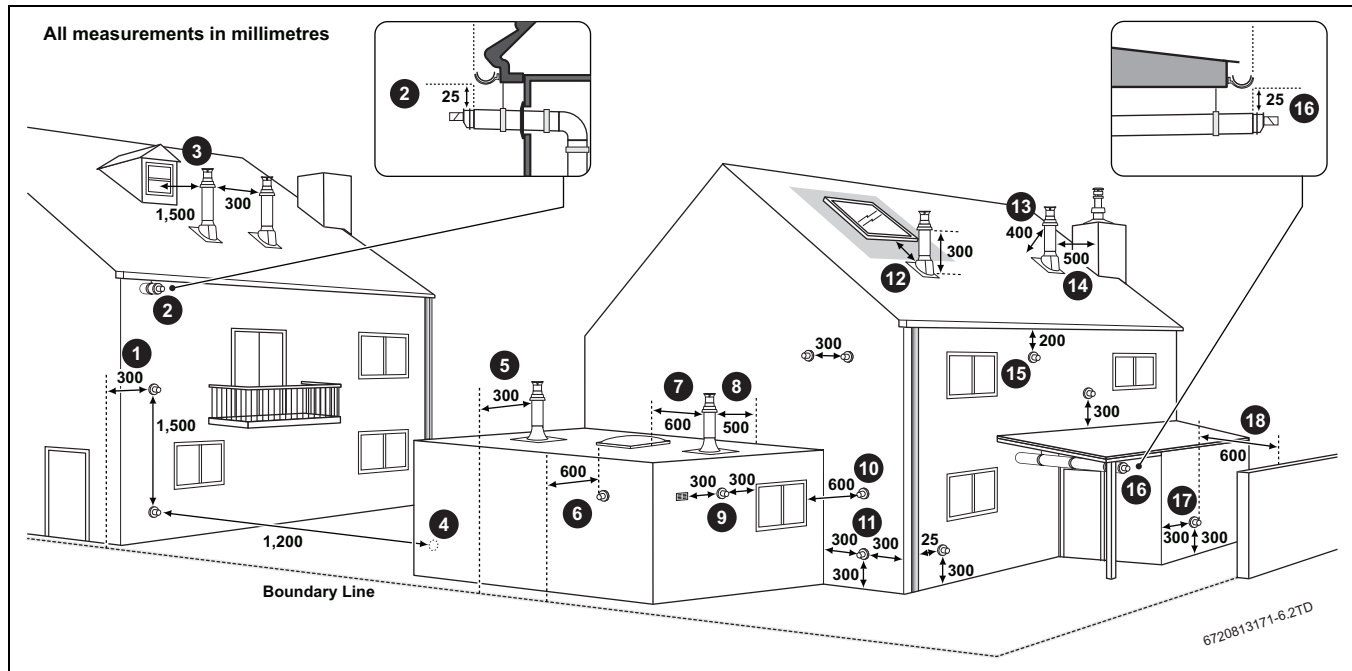


Fig. 32 Flue terminal positions - 50-V2 and 65-V2



NOTICE:

- ▶ All measurements are the minimum clearances required.
- ▶ Terminals must be positioned so to avoid combustion products entering the building.
- ▶ Support the flue at approximately one metre intervals and at a change of direction, use suitable brackets and fittings (125mm flue bracket (pack of 3) = T-000-082-131. 150mm flue bracket (pack of 3) = 7-716-191-102).

Key to illustration

1. 300mm adjacent to a boundary line.
2. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. Any external flue joints must be sealed with suitable silicon sealant.
3. 1,500mm between a vertical flue terminal and a window or dormer window, 300mm between two flue terminals.
4. 1,200mm between terminals facing each other.
5. Vertical flue clearance, 300mm adjacent to a boundary line.
6. 600mm distance to a boundary line, unless it will cause a nuisance. BS 5440:Part 1 recommends that care is taken when siting terminal in relation to boundary lines.
7. 600mm minimum clearance from a skylight to a vertical flue.
8. Vertical flue clearance, 500mm to non-combustible building material, and 1,500mm clearance to combustible building material.
9. 300mm above, below and either side of an opening door, air vent or opening window.
10. 600mm diagonally to an opening door, air vent or opening window.
11. 300mm to an internal or external corner.
12. 2,000mm below a Velux window, 600mm above or to either side of the Velux window.
13. 400mm from a pitched roof or in regions with heavy snow fall 500mm.
14. 500mm clearance to any vertical structure on a roof, 600mm to room sealed flue or 1,500 to an open flue.
15. 200mm below eaves and 75mm below gutters, pipe and drains.
16. The dimension below eaves, balconies and car ports can be reduced to 25mm, as long as the flue terminal is extended to clear any overhang. Any external flue joints must be sealed with suitable silicon sealant.

17. Flue clearance must be at least 300mm from the ground. Terminal guards must be fitted if the flue is less than 2 metres from the ground or if a person could come into contact with the flue terminal.
18. 600mm distance to a surface facing a terminal, unless it will cause a nuisance. BS 5440: Part 1 recommends that care is taken when siting terminals in relation to surfaces facing a terminal.



Note:

- ▶ Installations in car ports are not recommended.
- ▶ The flue cannot be lower than 1,000mm from the top of a light well due to the build up of combustion products.
- ▶ Dimensions from a flue terminal to a fanned air inlet to be determined by the ventilation equipment manufacturer.

In instances where the combined output of the installation exceeds 70kW net heat input the flue solution must be installed in accordance with the latest version of IGE/UP/10.

Plumbing will occur at the terminal so terminal positions where this could cause a nuisance should be avoided. Active plume management is encouraged.

The air supply and the flue gas exhaust must meet the applicable general regulations. Please also consult the instructions provided with the flue terminal kits prior to installation.

The boiler must be installed so that the terminal is exposed to external air.

It is important that the position of the terminal allows the free passage of air at all times.

Minimum acceptable spacing from the terminal to obstructions and ventilation openings are specified in IGE/UP/10. The minimum space between two concentric flue terminals is 300mm.


If the lowest part of the terminal is less than 2 metres above the level of the ground, balcony, flat roof or place to which any person has access, the terminal must be protected by a guard.

Ensure that the guard is fitted centrally.

The flue assembly shall be so placed or shielded as to prevent ignition or damage to any part of the building.

The flue outlet duct and the terminal of the boiler must not be closer than 25 mm to combustible material. Detailed recommendations on the protection of combustible material are given in IGE/UP/10.

4 Transport



CAUTION: Physical injury and damage to appliance due to incorrect lifting.

- ▶ At least two people are required to lift and position the boiler.
- ▶ Only hold the boiler at the sides and not at the control panel or flue connection (→ figure 33).

- ▶ If required, use a lifting and mounting aid.
- ▶ Transport the boiler to the installation location.

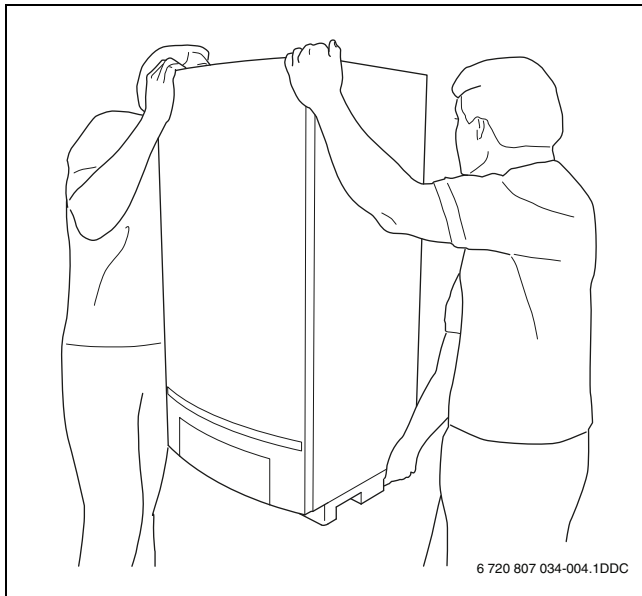



Fig. 33 Lifting and carrying the boiler correctly


5 Fitting



WARNING: Gas explosion.

- ▶ Turn off gas valve before working on gas-carrying components.
- ▶ Check for leaks before working on gas-carrying components.

5.1 Unpacking the boiler


 To ensure the connections are not damaged, only remove the styrofoam at the bottom once the boiler has been hung.

- ▶ Remove packaging and dispose of it.
- ▶ Prevent damage to the connections.
- ▶ Cover the connection for the flue gas/air supply on the top of the wall mounted gas condensing boiler to prevent ingress.

5.2 Check gas type

- ▶ Make sure that the gas type to which the boiler is connected corresponds to the gas type specified on the data plate (→ figure 4, [8]).

5.3 Mounting the boiler



NOTICE: Damage to appliance due to incorrect lifting.

- ▶ Lift the boiler with one hand underneath and the other on top of it.

The boiler may only be hung on the wall or installed on a cascade frame.

Wall-mounted installation

- ▶ Check whether the wall is strong enough to support the weight of the boiler, pump group and water content.
- ▶ Mount a fastening structure if required.
- ▶ Determine the position of the boiler on the wall.
- ▶ Mark holes using the mounting bracket supplied (→ figure 34).
- ▶ Install the mounting bracket on the wall with the assistance of a spirit level.

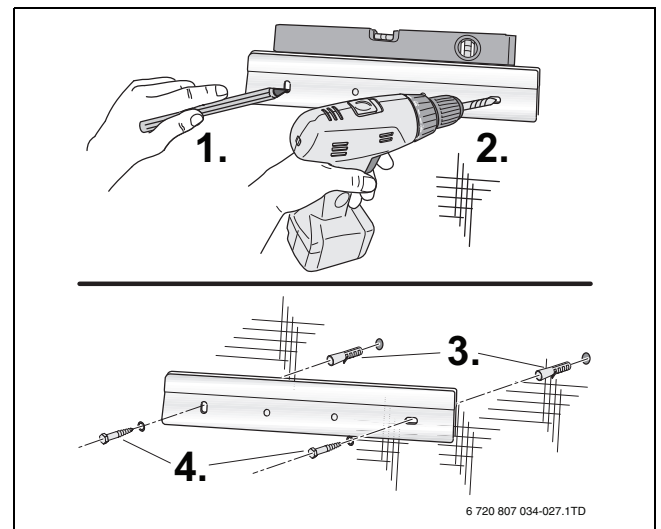


Fig. 34 Installing the mounting bracket on the wall

- ▶ Hook the boiler on to the mounting bracket
- ▶ Level the boiler using the set screw [1] and a spirit level.

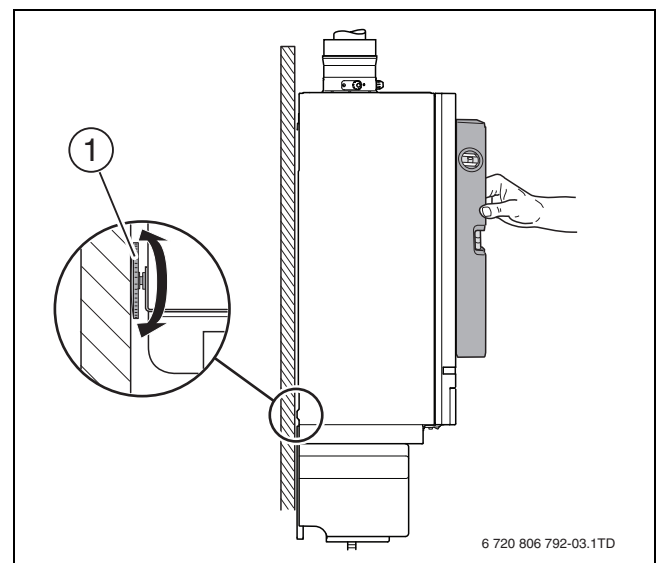



Fig. 35 Aligning the boiler

Mounting on a cascade frame

- ▶ For details on mounting the boiler in a cascade frame, see the installation instructions for the cascade system.

5.4 Remove the protective caps



NOTICE: Water damage.
The boiler may contain water. This can be discharged when the caps are removed.

- ▶ Keep a bucket and cloth handy.


- ▶ Take the caps off the connections on the underside of the boiler.

5.5 Hydraulic and gas connections

There are 2 ways to make the hydraulic and gas connections:

- Using the pump group (accessory) (→ Chapter 5.6)
- Without using the pump group (→ Chapter 5.7).

5.6 Mounting the pump group (accessory)



NOTICE: Installation damage.
The pump group includes a pressure relief valve.

- ▶ Check whether the excess pressure, the operating pressure and components in the heating system suite each other.
- ▶ If necessary, replace the PRV with a PRV of appropriate excess pressure. Maximum boiler pressure is 4 bar.

The following components have been incorporated into the pump group:

- Gas isolation valve
- Flow and return isolation valves
- Pressure gauge
- Thermometer
- Pressure Relief Valve
- Pump
- Drain & fill valve (DFV)

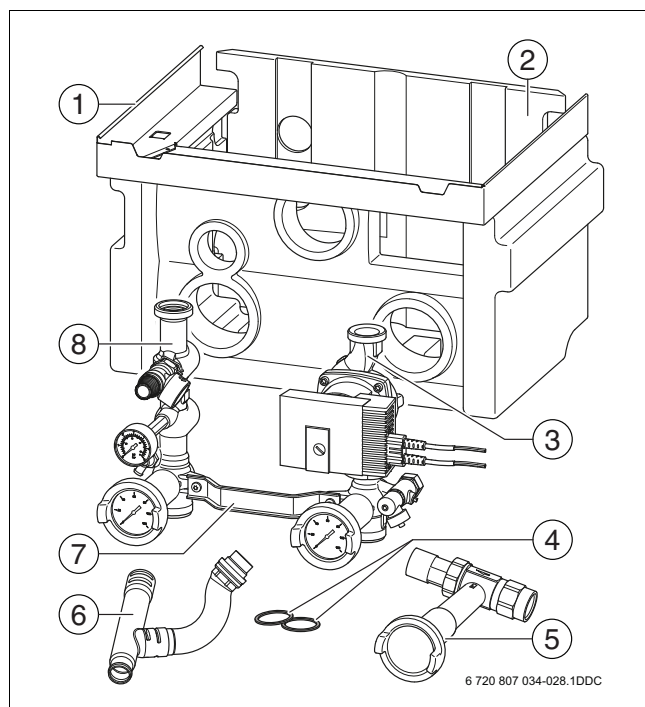



Fig. 36 Pump group scope of delivery

- [1] Casing (insulation)
- [2] Back panel (insulation)
- [3] Return pipe

- [4] Flat gasket 1½" (2 ×)
- [5] Gas isolation valve
- [6] PRV and condensate T-piece
- [7] Connection piece
- [8] Flow pipe

5.6.1 Installing the gas isolation valve



Avoid damage to the gas valve with older gas lines.

- ▶ Install a gas filter in the gas line.

- ▶ Seal the gas connection on the boiler using an approved sealant [1].
- ▶ Mount the gas isolation valve G 1" in the gas line [2].
- ▶ Connect the gas pipe without stress to the gas isolation valve.

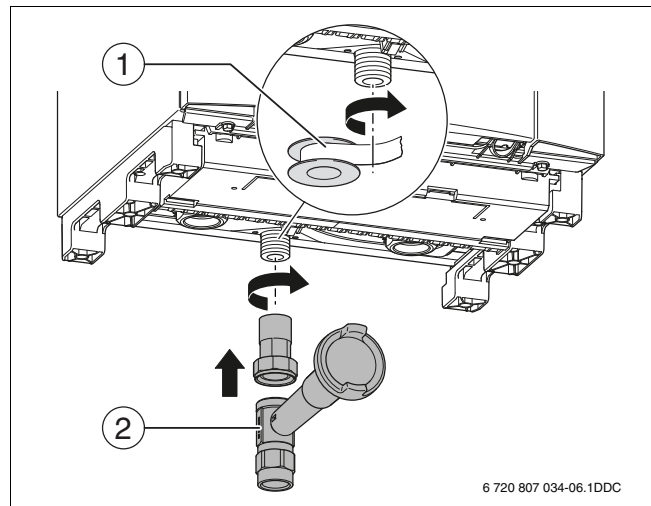


Fig. 37 Installing the gas isolation valve

- [1] Sealing agents
- [2] Gas isolation valve

5.6.2 Mounting the pump group

- ▶ Attach the screw fitting delivered with the boiler (→ figure 1, [8]) to the flow and return connection of the boiler.
- ▶ Connect the pump group to the flow and return connection of the boiler.
- ▶ Use the flat gaskets [1] (included in the scope of delivery) for this.

- ▶ Connect the flow and return line to the pump group, making sure they are free of stress. The minimum diameter of the supply and return line must be 1½" (Ø 35 mm).

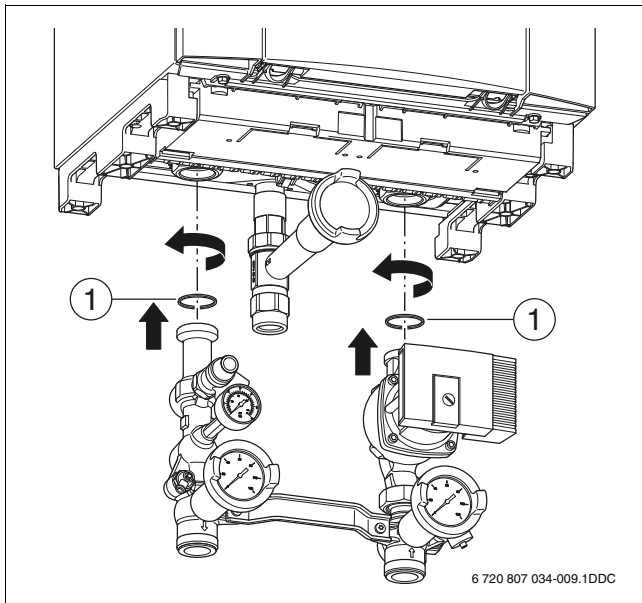


Fig. 38 Mounting the pump group

5.7 Hydraulic and gas connections (without pump group)

NOTICE: Damage to appliance due to excessive operating pressure.

- ▶ Mount a pressure relief valve between the boiler and isolation valve.

i To make maintenance easier:

- ▶ Mount a hydraulic isolation valve in the supply and return line.

- ▶ Connect the flow and return pipes to the boiler, making sure they are free of stress. The minimum diameter of the flow and return pipes must be 1½" (Ø 35 mm).

5.7.1 Gas connection

- ▶ Seal the gas connection on the boiler using an approved sealant [1].
- ▶ Use a gas isolation valve [2] with a diameter of at least 1".

- ▶ Connect the gas pipe without stress to the gas isolation valve.

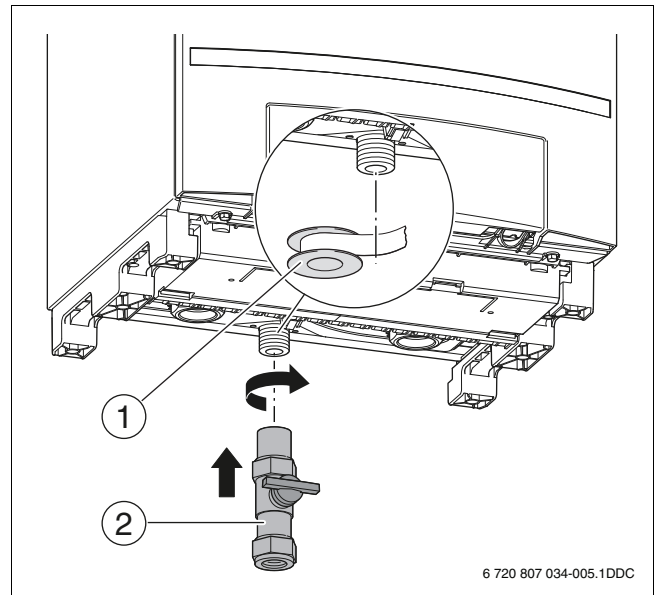


Fig. 39 Installing the gas isolation valve

- [1] Sealing agents
- [2] Gas isolation valve

5.7.2 Mounting the pump

- ▶ Select a pump based on the technical data (→ tab. 4, page 9).
- ▶ Take the required flow rate into account (→ tab. 8, page 10).

If a low loss header is not used:

- ▶ Select a pump that has a residual head of at least 200 mbar at the required flow rate.
- ▶ Install the pump [6] in the return pipe [5].

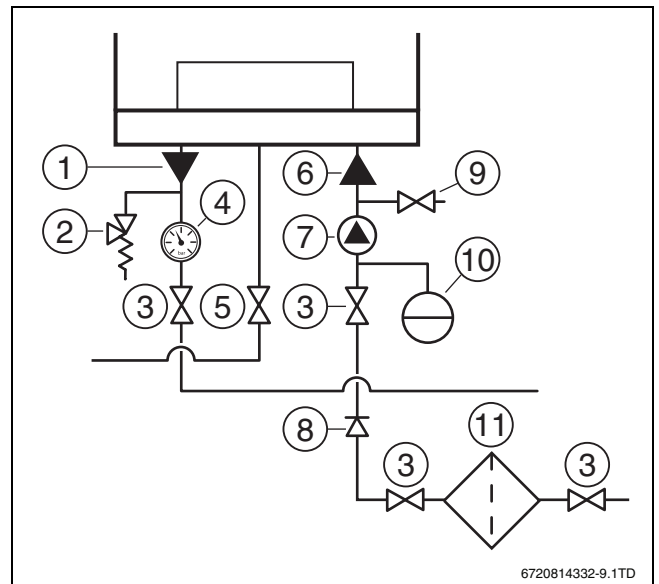


Fig. 40 Connection of the heating water pipework

- [1] Flow pipe
- [2] Pressure Relief Valve
- [3] Hydraulic isolation valve
- [4] Pressure gauge
- [5] Gas isolation valve
- [6] Return pipe
- [7] Pump
- [8] Non-return valve (only mandatory in cascades)
- [9] Drain & fill valve (DFV)
- [10] Expansion vessel
- [11] Dirt trap

5.8 Install the low loss header

If the residual head is insufficient with the required flow rate (→ tab. 8, page 10), a low loss header [1] must be installed to hydraulically separate the boiler and secondary circuit pumps.

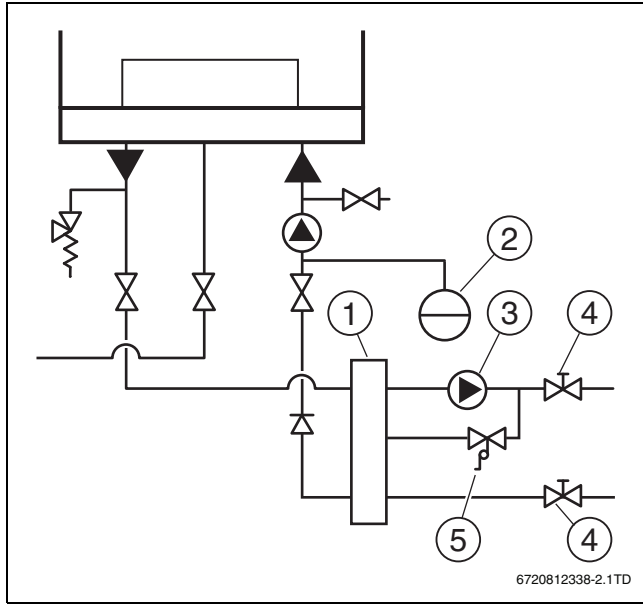


Fig. 41 Installation of the low loss header

- [1] Low loss header
- [2] Expansion vessel
- [3] Pump
- [4] Hydraulic isolation valve
- [5] Pressure differential controller (bypass)

5.9 Installing the siphon

- ▶ Remove the transport protection plug.

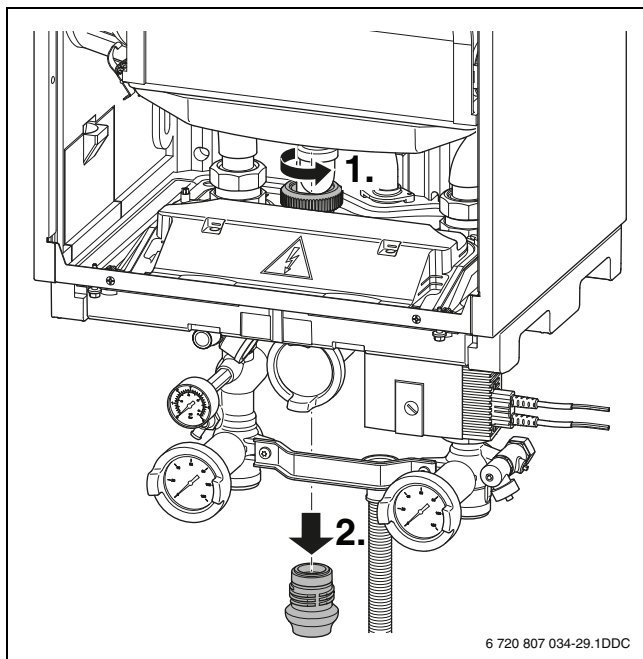


Fig. 42 Remove the transport protection plug

- ▶ Fill the condensate trap with water.

- ▶ Install the condensate trap.

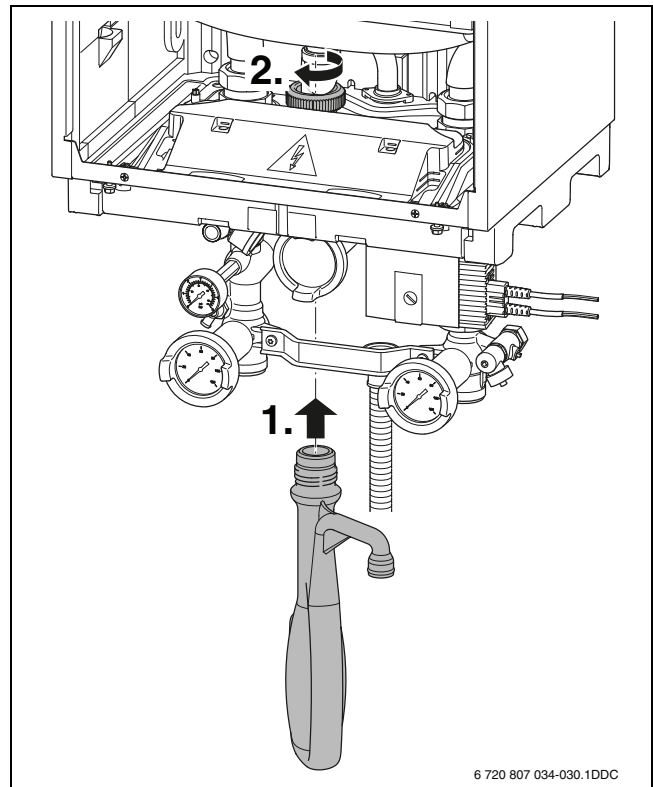


Fig. 43 Installing the condensate trap

With pump group

- ▶ Install the tee [1] between the pressure relief valve and the siphon. Combined PRV and condensate is optional.
- ▶ Mount the flexible hose [2].

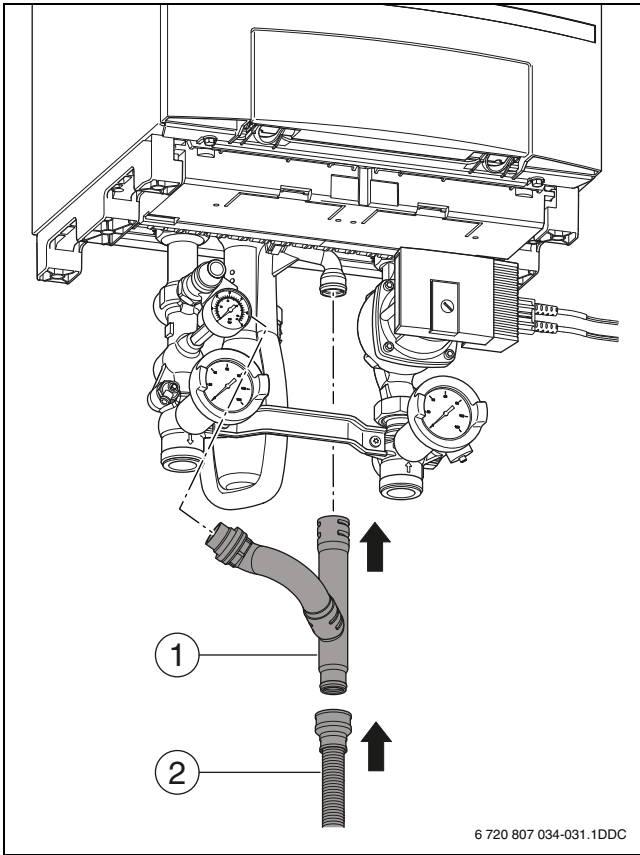


Fig. 44 Mounting the flexible hose

- [1] T piece
- [2] Flexible hose tube

Without pump group

- ▶ Connect the flexible hose to the siphon.

5.10 Connecting the condensate drain



NOTICE: Boiler damage.

- ▶ Make sure there is an open connection between the boiler and condensate discharge pipe.

- ▶ Use a waste water pipe made of plastic material with a diameter of at least Ø32 mm to remove the condensate.
- ▶ Install a trap in the waste water pipe.
- ▶ Connect horizontal pipe sections with a gradient of 53 mm per metre to the waste water pipe. The maximum length of the horizontal pipe section in this case is 5 m.
- ▶ Fill the trap in the waste water pipe.

5.11 Expansion vessel connection



Determine the size and supply pressure of the expansion vessel based on BS EN 12828.



If the option to connect the expansion vessel to the pump group is used with a back-to-back cascade installation (TR), a right-angled coupling is required in the front row of the boilers.

- ▶ Remove the cap from the connection point [1].
- ▶ Connect the connection pipe of the expansion vessel to the connection point.

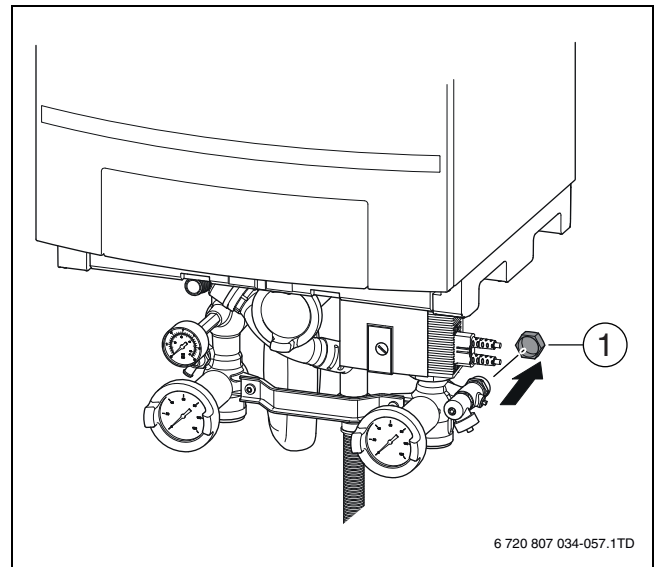


Fig. 45 Expansion vessel connection

5.12 Mounting the back panel insulation

- ▶ Hook the insulated rear panel of the pump group into the boiler.

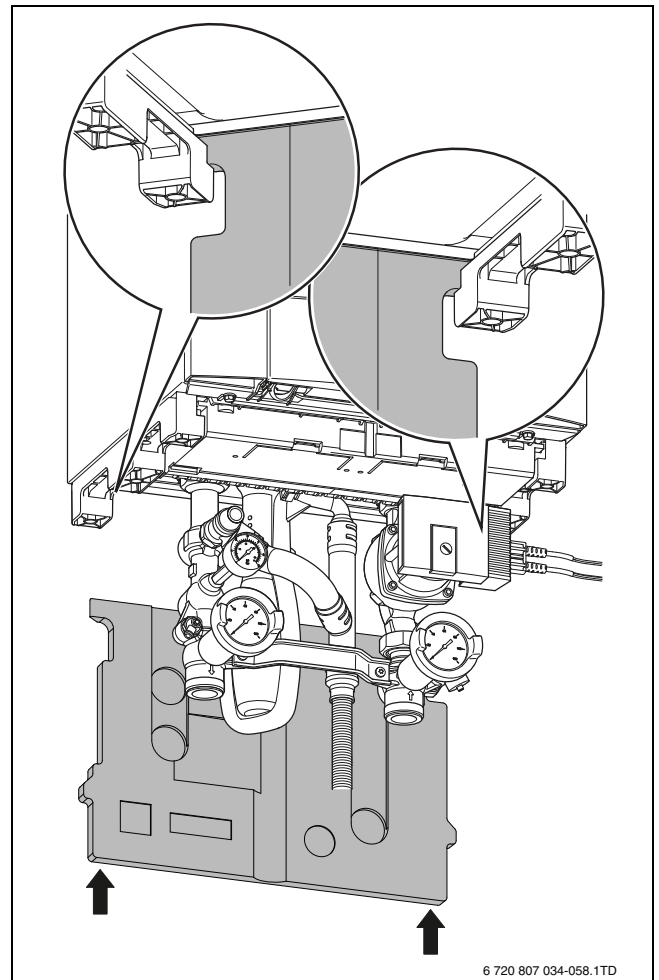


Fig. 46 Mounting the insulated rear panel

6 Electrical connection



CAUTION: Risk of electric shock

- ▶ Always isolate the boiler from the power supply before working on the electrical parts. Guard against unintentional re-connection.



NOTICE: Short circuit.

- ▶ Only use original cables if they must be replaced.



In order to commission and electrically isolate the boiler, the mains isolator and therefore the socket (230 V AC, 50 Hz) must be accessible at all times. The socket must be earthed (earthing contact).



Use a 2-wire power cable with 0.4 - 0.8 mm² cross-section for all 24 V AC connections on the terminal strip.

- ▶ When establishing the electrical connections, also observe the documentation and wiring diagram of the accessory being connected (→ chapter 2.13, page 8).

6.1 Control principle

The boiler is suitable for control according to the principles of room temperature-dependent and weather-dependent control.

- In the case of room temperature-dependent control, the user interface in the reference room controls the temperature required within it (room temperature-dependent controller). In order to control the temperature correctly, radiators must be equipped with manual radiator valves or the thermostatically controlled radiator valves must be fully open (→ figure 47).
- With weather-dependent control, the temperature in all rooms is controlled by thermostatically controlled valves mounted on the radiators. The controls can be installed in any location (→ figure 48).

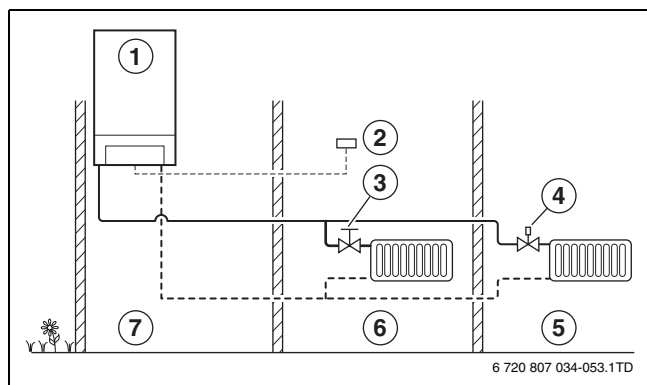


Fig. 47 Control principle of room temperature-dependent control

- [1] Boiler
- [2] Room temperature-dependent controller
- [3] Radiator valve
- [4] Thermostatically controlled radiator valve (TRV)
- [5] Other rooms
- [6] Living space
- [7] Installation location

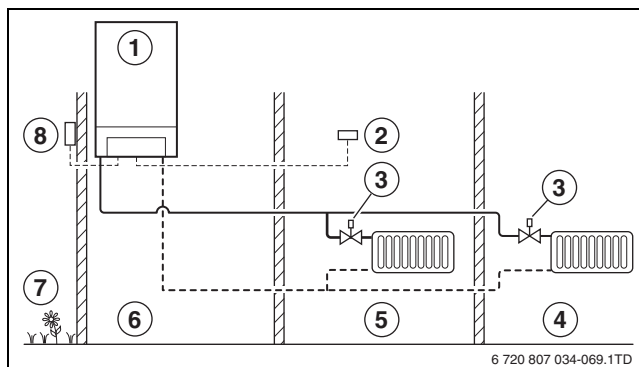


Fig. 48 Principle of weather-compensated control

- [1] Boiler
- [2] Room temperature-dependent controller
- [3] Thermostatically controlled radiator valve (TRV)
- [4] Other rooms
- [5] Living space
- [6] Installation location
- [7] External
- [8] Outdoor temperature sensor

6.2 Connection of the control units



Electrical work must only be carried out by qualified electrical contractors.

The terminal strip is located behind the cover.

- ▶ Unscrew the control panel and hang on the frame.

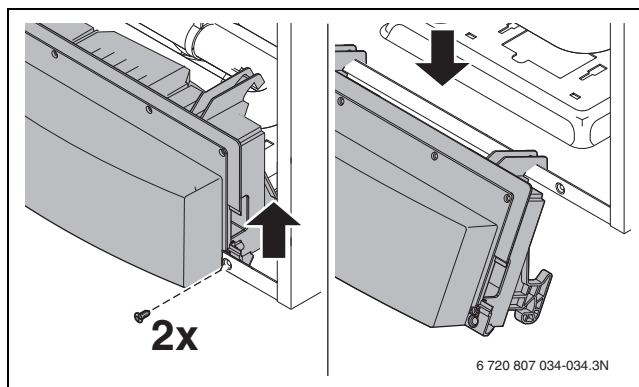


Fig. 49 Mounting the user interface

- ▶ Turn the locks a quarter turn clockwise then remove the cover.

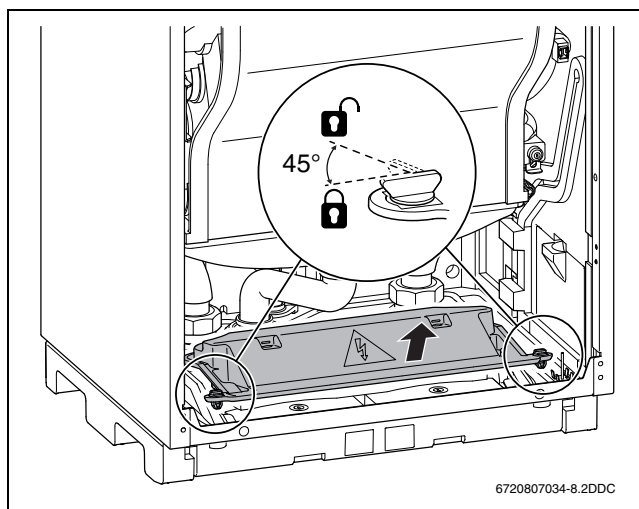


Fig. 50 Removing the cover

- ▶ Connect the components to the relevant plug.

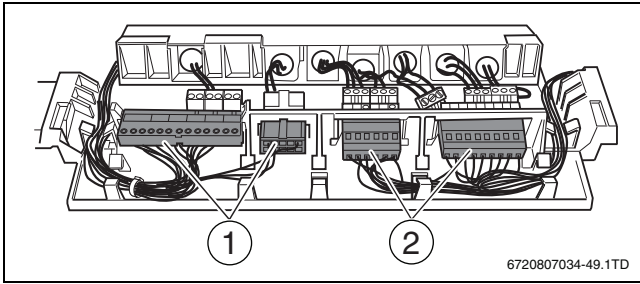


Fig. 51 Terminal strips

- [1] 24 V AC terminal strip
- [2] 230 V AC terminal strip

6.3 Installation of the strain relief

- ▶ Always pass the cable to be installed through a supplied strain relief mechanism before attaching it to a mains plug.
- ▶ Trim the grommet of the strain relief according to the dimension of the cable.

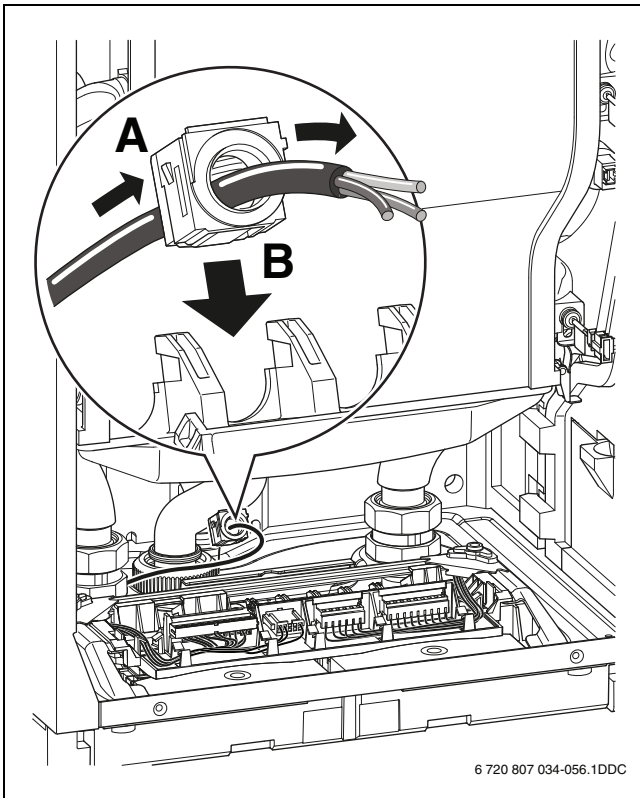


Fig. 52 Cable entry

- ▶ Connect the wire to the corresponding connector block.
- ▶ Plug the connector block in at the terminal strip.

- ▶ Tighten the screw of the strain relief.

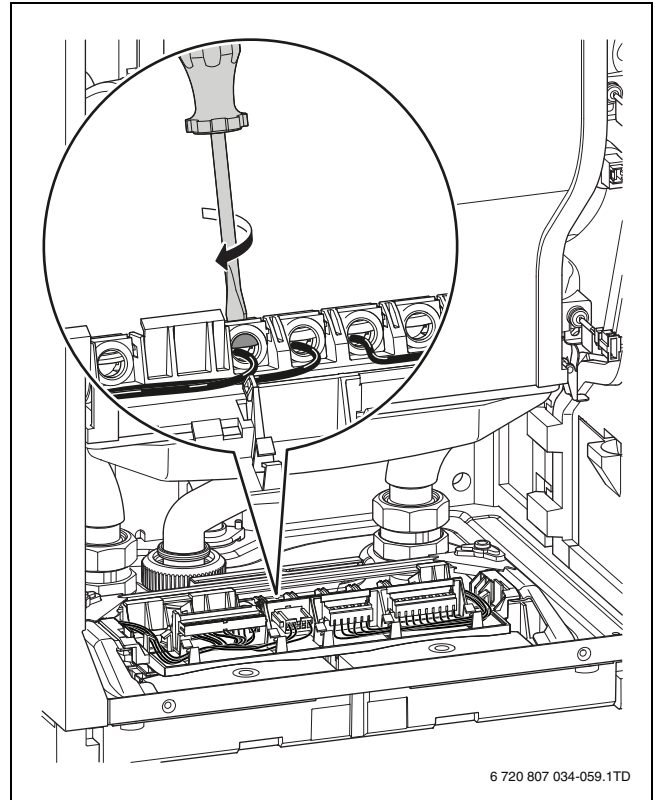


Fig. 53 Tightening the screw

6.4 Connecting the on/off room temperature-dependent control unit

All standard potential-free on/off room temperature-dependent control units without heat acceleration element (anticipation resistor) can be connected.

- ▶ Connect the on/off room temperature-dependent control unit via the green plug on the terminal strip [1]. The maximum permissible electrical resistance of this cable is 100 Ω.

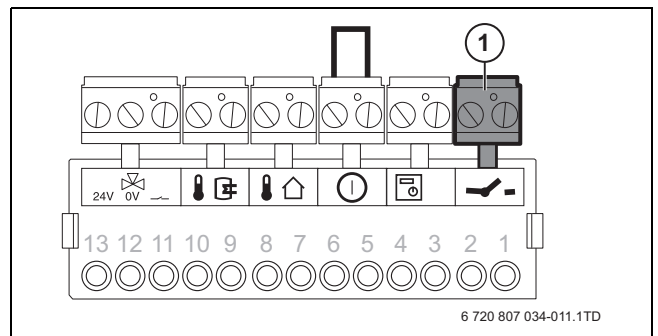


Fig. 54 Connecting the on/off room temperature-dependent control unit

6.4.1 Connecting the RTH convertor (only for 50-V2 and 65-V2)



WARNING:

- ▶ This appliance must be earthed.

The boiler can be fitted with the following external controls:

- a room-temperature control device at 230 V connected via the relay supplied (only for 50-V2 and 65-V2). For connection, see the electrical wiring diagram supplied with the 230 Volt convertor,
- On/off temperature controller, Volt free.

- ▶ Install the RTH convertor as specified in the accompanying wiring instructions.

6.5 Connecting the modulating controller

The following modulating controllers can be connected:

- Greenstar Sense II
- Commercial 8000 controls range

i For more information on other controllers and modules that can be used, please consult the manufacturer. You will find the relevant addresses on the back cover of these instructions.

- ▶ Install the modulating controller as specified in the accompanying instructions.
- ▶ Connect the modulating controller via the orange plug on the terminal strip [1] (BUS cable).

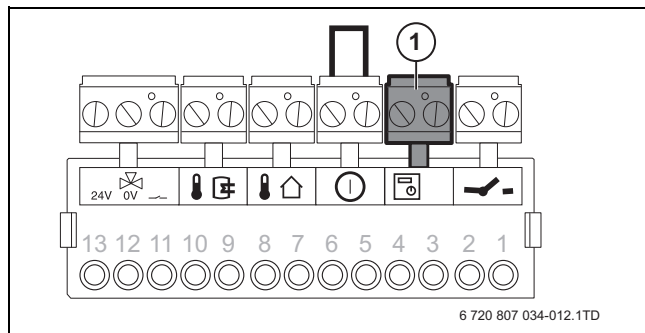


Fig. 55 Connection of the modulating controller

6.6 Connecting an external switching contact

An optional external switching contact can be used (to protect the underfloor heating system from excessive boiler temperatures for example). If the external switching contact opens, the boiler is switched off and the code "d3" appears on the boiler display.

All standard, potential-free switching contacts can be connected for use as external switching contacts.

- ▶ Remove the jumper in the red plug [1].
- ▶ Connect the external switching contact via the red plug on the terminal strip [1].

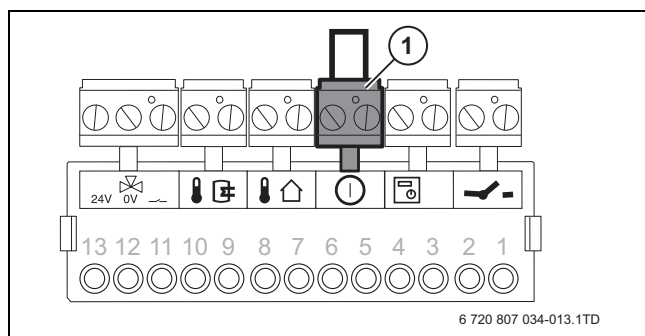


Fig. 56 Connection of an external switching contact

6.7 Connecting an outside temperature sensor (accessory)

i Only one outside temperature sensor can be combined with the installed controller.

- ▶ Connect the outside temperature sensor, supplied with weather compensating controller, via the blue connector block on the terminal strip [1].

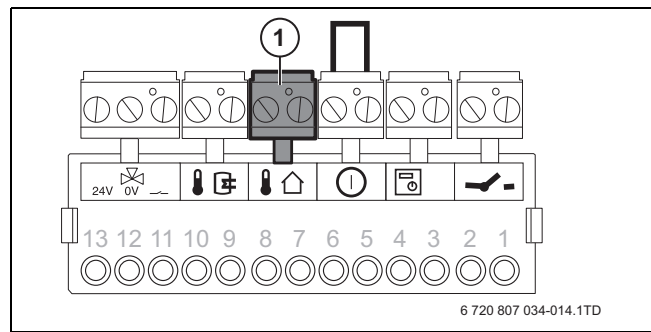


Fig. 57 Connecting the outside temperature sensor

6.8 Connecting a cylinder temperature sensor

Connection to the grey connector block is not possible.

6.9 Connecting the 3-way valve

Connection to the turquoise connector block is not possible.

6.10 Connecting the function module (accessory)

i For the assembly and combination options of the function modules, refer to the relevant installation instructions of the function modules.

- ▶ Connect the BUS cable to the connection for the modulating controller (→ chapter 6.5).
- ▶ Connect the power supply of the function module to the connector block [1]. Use the power cable supplied with the function module for this.

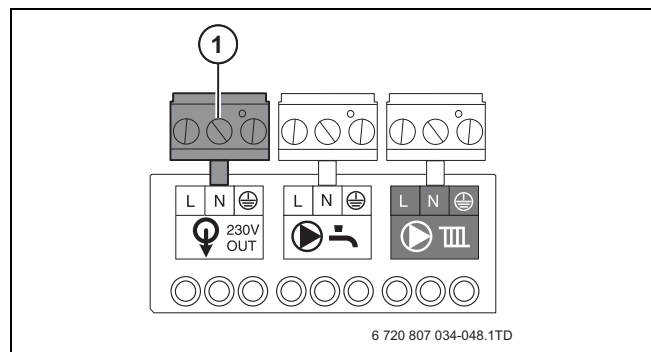


Fig. 58 Connecting the mains voltage

6.11 Connecting the cylinder primary pump

Connection to the grey pump connector block is not possible.

6.12 Connecting the hot water circulation pump

Connection to the purple connector block is not possible.

6.13 Connecting the pump

With pump group:

- ▶ Connect the control signal wire from the pump to the white plug of the terminal strip [1].
- ▶ Remove the green plug [2] from the terminal strip.
- ▶ Connect the pump's power cable to the terminal strip [2].
- ▶ Fasten both cables using the strain relief devices mounted beforehand on the cables.

Without pump group:

- ▶ Slide the strain relief (provided) over the power cable of the pump.

- ▶ Connect the pump's power cable to the green connector block on the terminal strip [2].

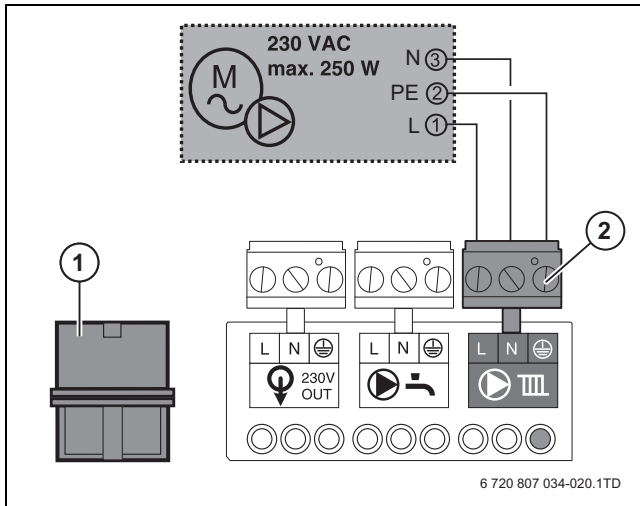


Fig. 59 Connection of pump

6.14 Connecting to the mains

DANGER: Danger of fatal accident due to electric shock.

- ▶ Disconnect the boiler from the mains power supply before working on the boiler. Guard against unintentional re-connection.

i All Worcester boilers require a permanent live.

A mains supply of 230 V - 50 Hz is required.

External controls are suitable for volt free installation (or 230V via the relay supplied with the 50-V2 and 65-V2 boilers).

Wiring to the boiler must be in accordance with the current I.E.E. (BS 7671) Wiring Regulations and any local regulations.

Wiring should be a 3 core PVC insulated cable, not less than 0.75 mm² (24 x 0.2mm), and to table 16 of BS 6500.

Connection must be made in a way that allows complete isolation of the electrical supply such as a double pole switch having 3 mm contact separation in both poles, or by a three pin connector, serving only the boiler and system controls. This boiler is equipped with a double pole switch [1]. The means of isolation must be accessible to the user after installation.

The electrical connection to the mains supply should be readily accessible and adjacent to the boiler.

If the supply cord is damaged, it must be replaced by a qualified electrician to avoid a hazard and must be an original spare part.

The electrical supply for both the boiler and the system must be taken from the same fused spur outlet.

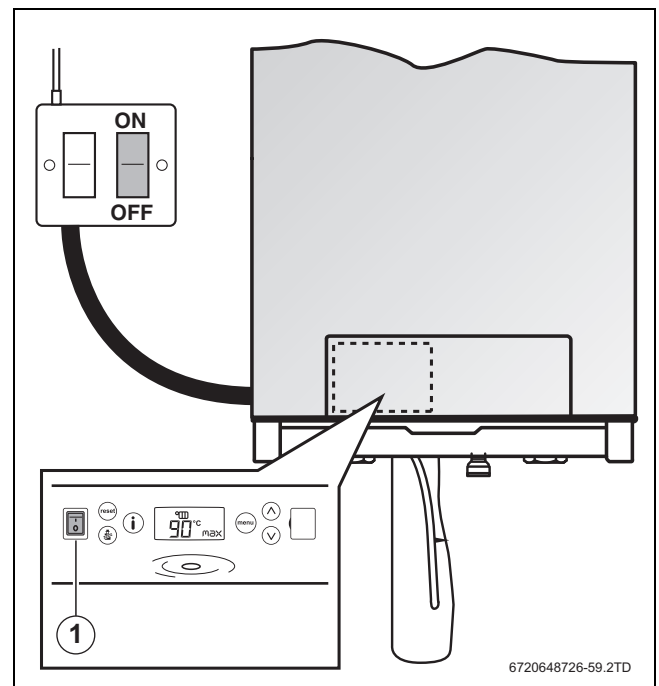


Fig. 60 Mains supply

- [1] Switch

7 Operating the boiler

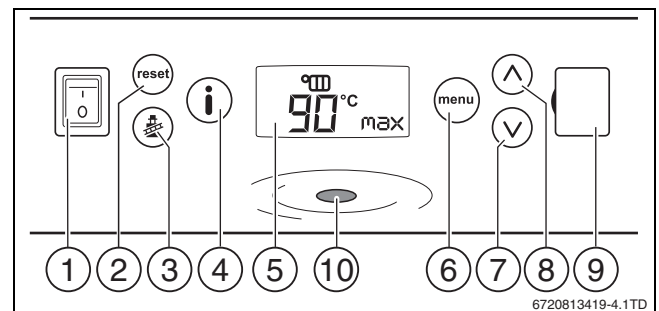


Fig. 61 Control panel


- [1] On/off switch
- [2] Reset key
- [3] Chimney sweep key
- [4] Help key
- [5] Display
- [6] Menu key
- [7] Down key
- [8] Up key
- [9] Diagnostic plug
- [10] Burner LED

The front of the boiler contains a control panel with the following elements:


On/off switch

The boiler can be switched on or off via the on/off switch. The power supply is not interrupted.

Reset key

The boiler can be restarted via the  key in the event of interlocking faults (→ Chapter 12.2 "Reset").

Chimney sweep key

The boiler can be brought into operation via the  key in order to carry out measurements. Used for servicing.

Info  key

The boiler status is displayed via the  key.

Display

Display values, settings and codes can be read off the display. When the boiler is first switched on via the mains plug, all symbols appear briefly in the display.











Status display	
Display when the boiler is switched on (approx. 1 second)	
	20.0 Current flow temperature [°C]
	02.0 Operating pressure [bar] (display flashes if the operating pressure is too low)
	Chimney sweep mode (service operation)
	Burner in operation
	Central heating ON
	DHW ON
	Pump running
	Outside temperature display
	An interlocking fault has occurred or the boiler requires a service.

Table 13 Display indications in normal mode

Menu  key

To change the settings, open the setup menu via the  key.

Down  and up  keys

You can navigate the various menus via the arrow keys. Press an arrow key to change a setting or value.


Diagnostic plug

An external diagnostic tool can be connected here.





Burner LED

The Burner LED lights up when the burner is firing.

7.1 Information menu

 After a few minutes of inactivity, the menu closes automatically and the home screen is displayed.

Information on the status of the boiler is displayed on the information menu. Proceed as follows:

- ▶ Press  to open the information menu.
- ▶ Navigate the menu with  and .
- ▶ Press  to close the information menu.



Information menu	
	"info" is displayed for 1 second.
	Maximum boiler flow temperature set [°C] during heating mode and chimney sweep mode. "OFF" appears in the display when heating mode is switched off.

Table 14 Information menu




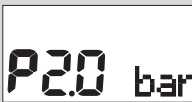















Information menu	
	No information about DHW mode is shown here.
	Display of service code. This information is only displayed if the wall mounted gas condensing boiler requires a service intervention. For a comprehensive overview of the display codes and corresponding explanations see chapter 12.
	Displays an operating code or fault code. For a comprehensive overview of the display codes and corresponding explanations see chapter 12.
	Current operating pressure [bar].
	Current boiler flow temperature [°C].
	Outside temperature [°C]. Only displayed with weather-compensated control.
	Calculated boiler flow temperature (setpoint) [°C] during heating mode  .
	Current ionisation current [µA].
	Current burner output [%] during heating mode  . Mod = modulation
	Current pump speed [%]. Mod = modulation

Table 14 Information menu

7.2 Setup menu

The boiler settings can be displayed and modified via the setup menu. Proceed as follows:

- ▶ Press  to open the setup menu.
- ▶ Navigate the menu with  and .
- ▶ Press and hold  to access a setting. Once the setting flashes it can be modified.
- ▶ Change the setting via  and .
- ▶ Press  to save the setting. The setting no longer flashes.

The display values shown are the default settings.


Setup menu	
	"menu" is displayed for 1 second.

Table 15 Setup menu













Setup menu	
 On	Heating mode is switched on. Setting: On, Off.
 80 °C max	▶ Set the maximum boiler flow temperature based on the heating system type. Adjustment range: 30 - 90 °C. Examples of settings: • 40 °C underfloor heating system • 75 - 85 °C radiators • 85 - 90 °C convectors
 490 kW	▶ Set the maximum output of the heating system. The output is displayed in % when modifying the setting. Adjustment range: 0 - 100%.
 off	No information about DHW mode is shown here.
 30%min	▶ Change the minimum pump speed if required. Adjustment range: 30 % - max. (setting max. parameter). ▶ Increase the minimum pump speed if parts of the heating system do not become hot enough.
 70%max	▶ Change the maximum pump speed if required. Adjustment range min. (setting min. parameter): • 50-V2 - 57% • 65-V2 - 65% • 85-V2 - 65% • 100-V2 - 83% ▶ Reduce the maximum pump speed if aggravating flow noises can be heard.
 i Min	Pump over-run time following end of heating demand [Min]. Adjustment range: 1 - 60 min./24 hours.


Table 15 Setup menu

7.3 Chimney sweep mode

 Chimney sweep mode terminates automatically after 30 minutes. Settings that have been changed in chimney sweep mode are cancelled.

You can put the boiler into heating mode when in chimney sweep mode in order to carry out measurements.

- ▶ Make sure that the boiler can dissipate the heat generated in chimney sweep mode.
- ▶ Press  for 5 seconds to activate chimney sweep mode. The chimney sweep symbol  [1] appears in the display. Chimney sweep mode now remains active at 100% output for 30 minutes.
- ▶ Set the required output (in %) [3] via  and .
- ▶ Perform the required measurement.

- ▶ Hold down  to switch off the chimney sweep mode.

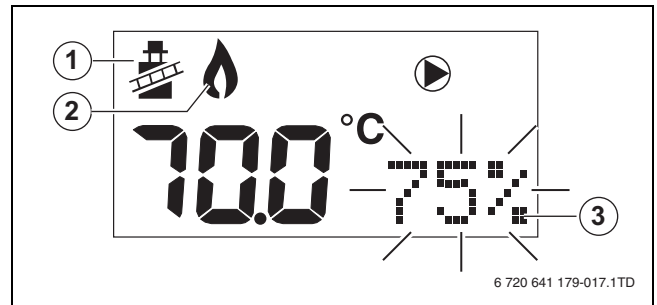






Fig. 62 Display in chimney sweep mode

7.4 “Fault history” menu

This menu shows the last 3 interlocking fault displays in the form of fault codes.

- ▶ Hold down  for 5 seconds to open the “Fault history” menu.
- ▶ Press  or  to display the last 3 fault messages. The fault displays are chronologically identified with “Log1” to “Log3”. For further details on the meaning of fault codes see chapter 12).
- ▶ Press  to exit the “Fault history” menu and return to the home screen.

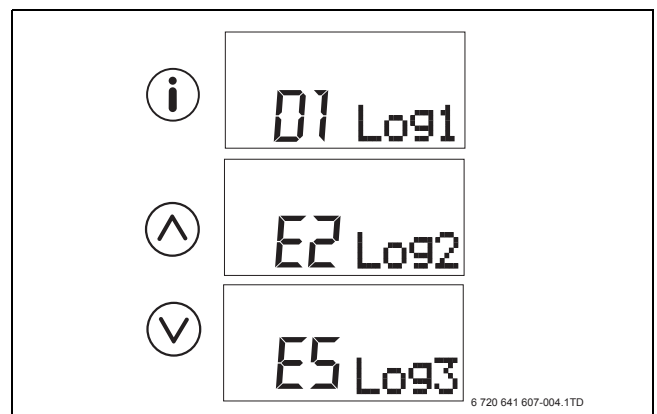




Fig. 63 Fault history

7.5 Key lock

The setup menu can be locked to prevent the settings from being changed by unauthorised personnel. Proceed as follows:

Activation

- ▶ Press the  and  keys simultaneously for 5 seconds,
- ▶ The word “Lock” is displayed for 5 seconds (→ figure 64). The information menu remains readable.

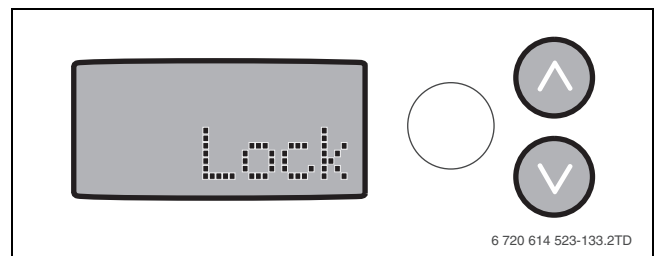




Fig. 64 Display - Lock

Disable

- ▶ Press the  and  keys again simultaneously for 5 seconds to remove the key block; the word “Lock” disappears.

8 Commissioning



WARNING: Gas explosion.

- ▶ Check for gas tightness after carrying out work on gas-carrying components.

- ▶ The Benchmark Checklist (→ page 50) must be completed for all 50-V2 and 65-V2 installations.
- ▶ Complete the commissioning report for type 85-V2 and 100-V2 installations during the commissioning procedure (→ Chapter 8.15, page 37).

8.1 Filling the heating system



NOTICE: Boiler damage.

- ▶ Take the water quality into account when filling the heating system (→ Chapter 3.2).



The target charge pressure of the heating system depends (among other things) on the:

- location of the boiler
- opening pressure of the safety valve
- inlet pressure of the expansion vessel.
- ▶ Take the above points (factors) into account when filling the heating system.



During initial commissioning, the boiler is brought into operation as soon as the operating pressure exceeds 0.8 bar. If the pressure drops to below 0.2 bar, the boiler will not subsequently go into operation.

- ▶ Open all radiator valves.
- ▶ Unscrew the cap of the automatic air vent valve (→ Chapter 2.12, figure 4) on the top of the heat exchanger on the left.
- ▶ Open the hydraulic isolation valves (→ Chapter 2.12, figure 4).
- ▶ Fill the heating system via a WRAS approved filling method.
- ▶ Fill the heating system to a minimum pressure of 3 bar and close the filling valve.
- ▶ Bleed radiators.
- ▶ Fill the heating system again to a minimum pressure of 3 bar.
- ▶ Turn on the earthed electrical supply.
- ▶ Open gas isolation valve.

8.2 Purging the gas line

- ▶ Purge air from the gas supply pipe work in a safe appropriate manner.
- ▶ Ensure adequate ventilation during the purge and that other persons nearby are briefed that a gas purge is in operation.
- ▶ Bring the boiler into operation.

8.3 Inspecting the flue system



WARNING: flue gas poisoning.

- ▶ Check for leaks before working on gas-carrying components.

- ▶ Check whether the boiler is connected to a flue system as specified in the flue pipe documentation provided.

8.4 Adjusting the output

The output of the boiler can be adapted to the heat energy demand via the setup menu. Proceed as follows:

- ▶ Adjusting the output via the setup menu (→ Chapter 7.2).
Observe the following table when making the adjustment.

Display [%]	Boiler type			
	50-V2	65-V2	85-V2	100-V2
20	–	14.3	–	20.8
25	–	17.8	20.8	25.7
30	14.3	21.2	25.0	30.6
35	16.8	24.7	29.3	35.6
40	19.4	28.1	33.5	40.5
45	21.9	31.6	37.8	45.4
50	24.5	35.0	42.0	50.3
55	27.0	38.5	46.3	55.2
60	29.6	41.9	50.5	60.2
65	32.1	45.4	54.8	65.1
70	34.6	48.8	59.0	70.0
75	37.2	52.3	63.3	74.9
80	39.7	55.7	67.5	79.8
85	42.3	59.2	71.8	84.7
90	44.8	62.6	76.0	89.7
95	47.4	66.5	80.3	94.6
–	49.9	69.5	84.5	99.5

Table 16 Output as a percentage [kW]

8.5 Setting the maximum boiler temperature

- ▶ Adjust the maximum set flow temperature in the setup menu (→ Chapter 7.2).

8.6 Adjusting the pump group



In order for the heating system to function correctly the pump must be controlled by the burner control unit. To do so, the pump setting must be set to the medium level.

- ▶ Set the pump via the red knob on the front to medium level, "Ext. in".
- ▶ Adjust the pump run-on time in the setup menu (→ Chapter 7.2).

8.7 Testing the gas supply pressure

Measure the gas supply pressure when the burner is in operation at full load. Proceed as follows:

- ▶ Take the boiler out of operation.
- ▶ Remove the casing.
- ▶ Close gas isolation valve.
- ▶ Make sure the heating system can dissipate the heat generated.

- ▶ Undo the test nipple for the gas supply pressure [1] by turning it through 2 revolutions.

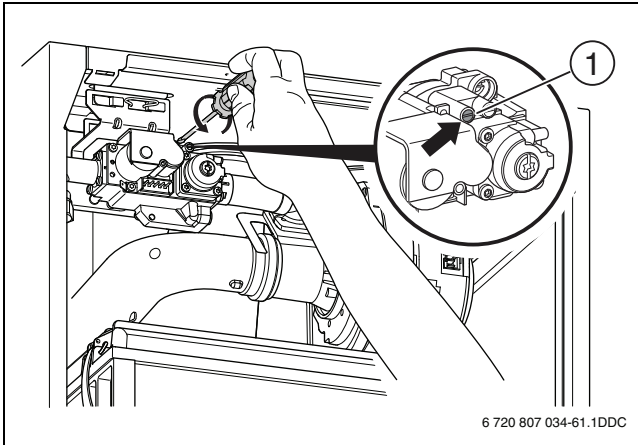


Fig. 65 Open the burner pressure nipple at the 50-V2 and 65-V2

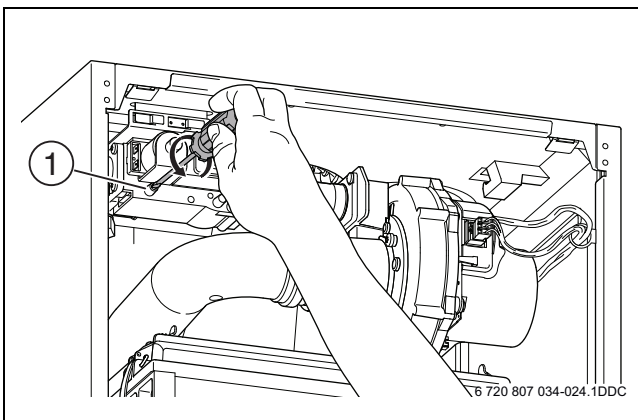


Fig. 66 Open the burner pressure nipple at the 85-V2 and 100-V2

- ▶ Set the pressure gauge to "0".
- ▶ Connect test hose to the plus connector of pressure gauge and the test nipple for the gas supply pressure [1].

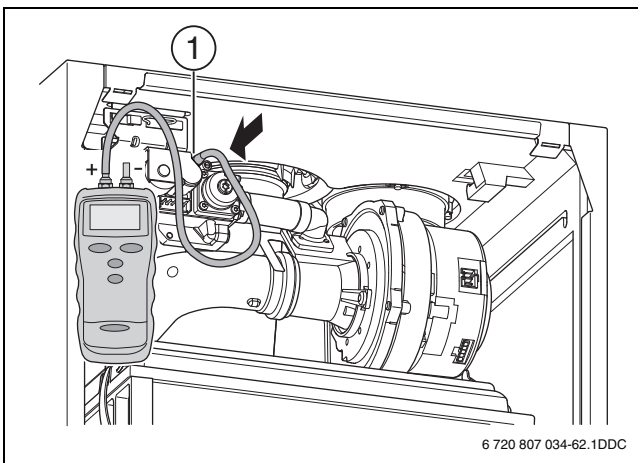


Fig. 67 Connecting the pressure gauge at 50-V2 and 65-V2

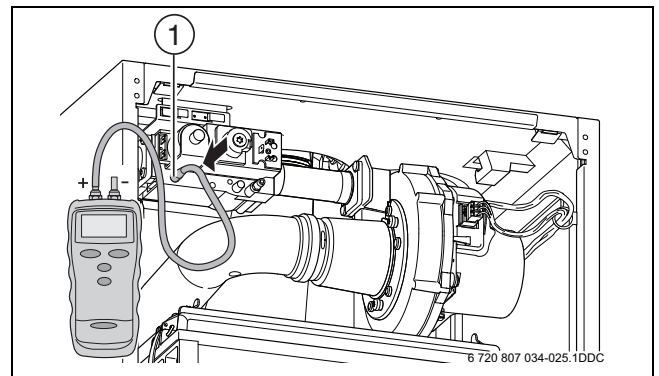


Fig. 68 Connecting the pressure gauge at the 85-V2 and 100-V2

- ▶ Open the gas isolation valve.
- ▶ Bring the boiler into operation.
- ▶ Make sure that the boiler can dissipate the heat generated.
- ▶ Start the chimney sweep mode (→ Chapter 7.3).
- ▶ Set the output to 100%.
- ▶ Measure the gas supply pressure.
- ▶ Enter value in maintenance protocol.
- ▶ Check that the measured value is not less than the permissible value (→ tab. 6, page 10).



Never commission the appliance above or below these values. The cause must be established without fail and the fault rectified. If this is not possible, shut off the gas supply and contact the gas supplier.

- ▶ Take the boiler out of operation.
- ▶ Close the gas isolation valve.
- ▶ Remove the pressure gauge.
- ▶ Close test nipple for gas supply pressure.
- ▶ Open the gas isolation valve.
- ▶ Bring the boiler into operation.
- ▶ Check gas tightness of the boiler.

8.8 Measure gas/air ratio



NOTICE: Damage to the boiler due to incorrect setting. The gas valve is exceptionally reliable and therefore requires no adjustment:

- ▶ Only the gas/air ratio may be measured.
- ▶ If the measurement is out of spec, the gas valve must be replaced.

- ▶ Take the boiler out of operation.
- ▶ Close the gas isolation valve.
- ▶ Undo the nozzle pressure test nipple [1] by turning it through 2 revolutions.

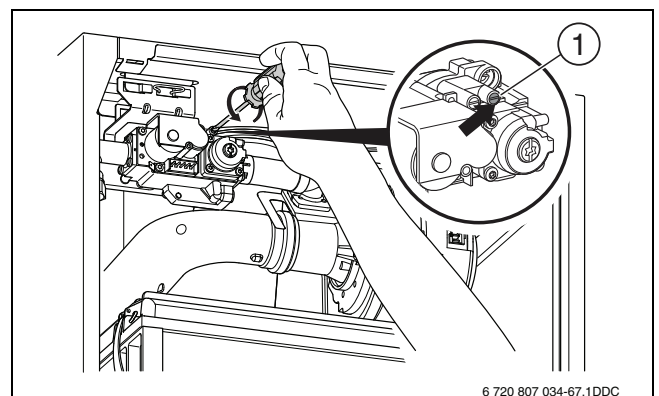


Fig. 69 Open the burner pressure nipple at the 50-V2 and 65-V2

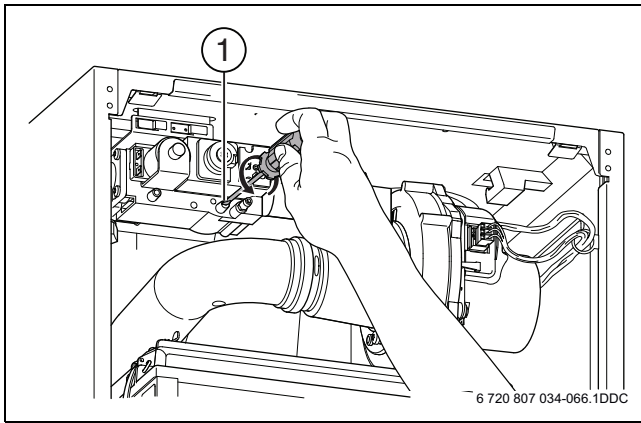


Fig. 70 Open the burner pressure nipple at the 85-V2 and 100-V2

- ▶ Connect the pressure gauge.
- ▶ Set the pressure gauge to "0".
Hold the pressure gauge at the same height when the measurement is in progress.
- ▶ Open the gas isolation valve.
- ▶ Bring the boiler into operation.
- ▶ Make sure that the boiler can dissipate the heat generated.
- ▶ Start the chimney sweep mode (→ Chapter 7.3).
- ▶ Set the smallest possible output value (partial load).
- ▶ Measure the gas/air ratio.

This differential pressure must be between -10 and 0 Pa (-0.10 and 0.00 mbar) with partial load. If not, the gas valve must be replaced.

- ▶ Enter the measurement in the maintenance protocol (→ Chapter 11.15, page 43).
- ▶ Exit the chimney sweep mode.
- ▶ Take the boiler out of operation.
- ▶ Close the gas isolation valve.
- ▶ Remove the pressure gauge.
- ▶ Close the test nipple.
- ▶ Open the gas isolation valve.
- ▶ Bring the boiler into operation.

8.9 Measure the CO and CO₂ content



Assuming combustion with excess air, the CO content of the flue gas must be less than 350 ppm, or 0.035 % by volume. If the CO content is roughly 350 ppm or higher, the cause, which is most likely to be related to soiling of the burner, a defect in the burner or recirculation of the flue gases, must be found.

- ▶ Take the boiler out of operation.

- ▶ Remove the cap of the flue gas testing point [1].

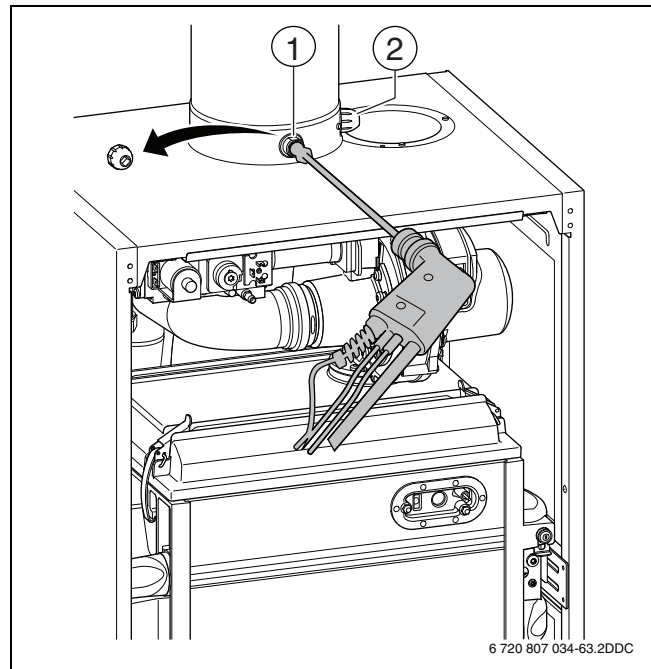


Fig. 71 Removing the cap of the flue gas testing point

- [1] Flue gas testing point
- [2] Air supply testing point

- ▶ Connect the flue gas analyser to the test point.
- ▶ Bring the boiler into operation.
- ▶ Make sure that the boiler can dissipate the heat generated.
- ▶ Start the chimney sweep mode (→ Chapter 7.3).
- ▶ Switch off the chimney sweep mode.
- ▶ Take the boiler out of operation.
- ▶ Remove the flue gas analyser.
- ▶ Mount the cap of the flue gas testing point.
- ▶ Bring the boiler into operation.

8.9.1 CO and combustion checks

The following combustion and flue integrity checks are mandatory from April 2014 and these values must be recorded on the Benchmark check list, at the back of this manual.

Once the gas rate and pressure have been confirmed as acceptable then the CO and combustion checks can be undertaken.



The boiler case must be fitted whilst these checks are carried out.



NOTICE: BEFORE CO AND COMBUSTION CHECKS:

- ▶ Refer to section 5.2 and section 8.7 a to verify gas type, gas inlet pressure, and gas rate. Visually check the integrity of the whole flue system and confirm that all the components are correctly assembled, fixed and supported.
- ▶ The flue gas analyser must be the correct type as specified in BS 7967. Before use the analyser must have been calibrated as specified by the manufacturer. The installer must be competent in the use of the analyser. Check and zero the analyser in fresh air as specified by the manufacturer.
- ▶ The gas valve is factory set and must not be adjusted during commissioning if found to be out of tolerance, please contact the Worcester, Bosch Group help line 0330 123 3366.

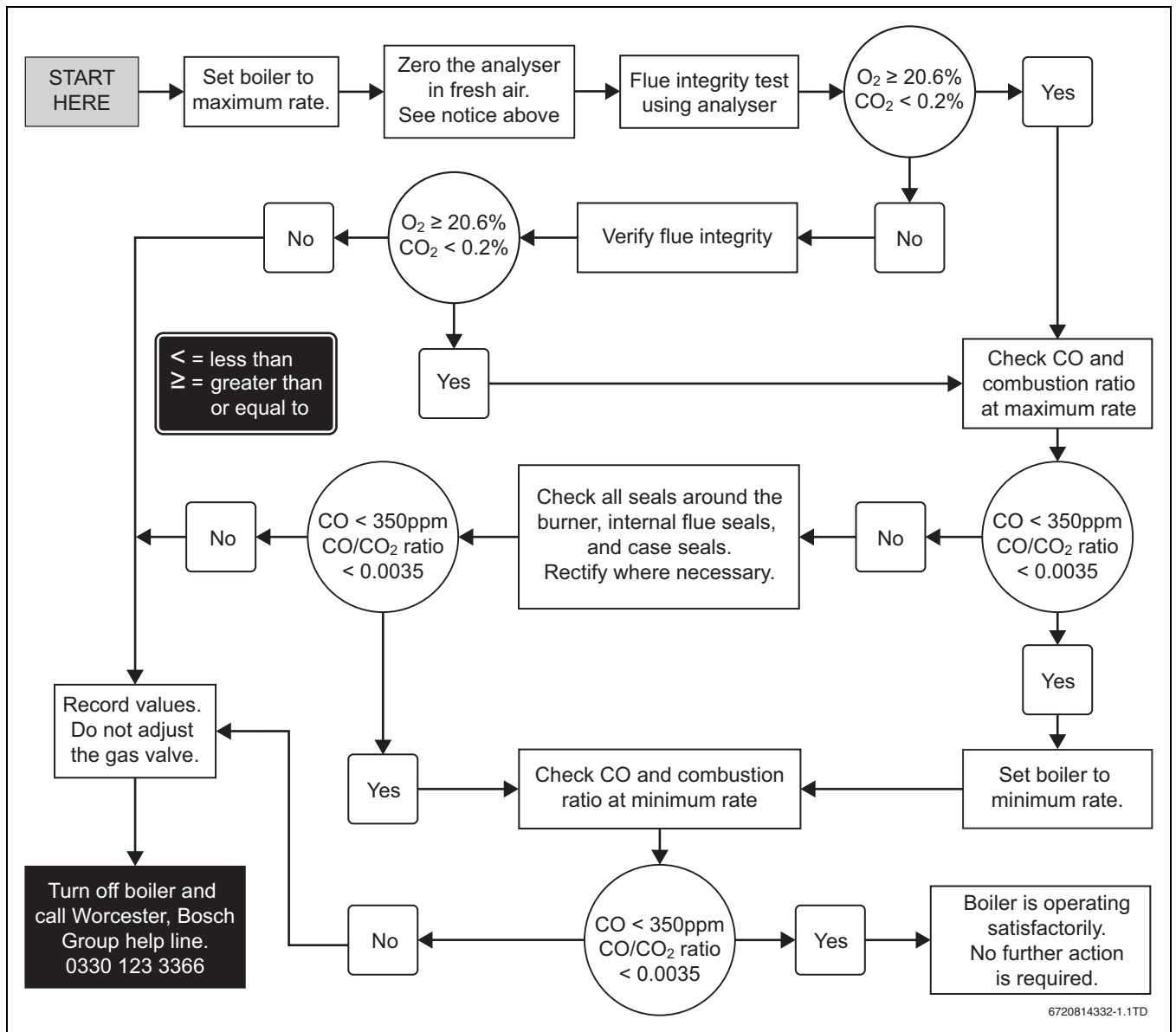


Fig. 72 Combustion check flow chart

8.10 Measure ionisation current

- ▶ Take the boiler out of operation.
- ▶ Pull the connector plugs apart.
- ▶ Connect the multi-meter on both sides of the open plugs (in series).

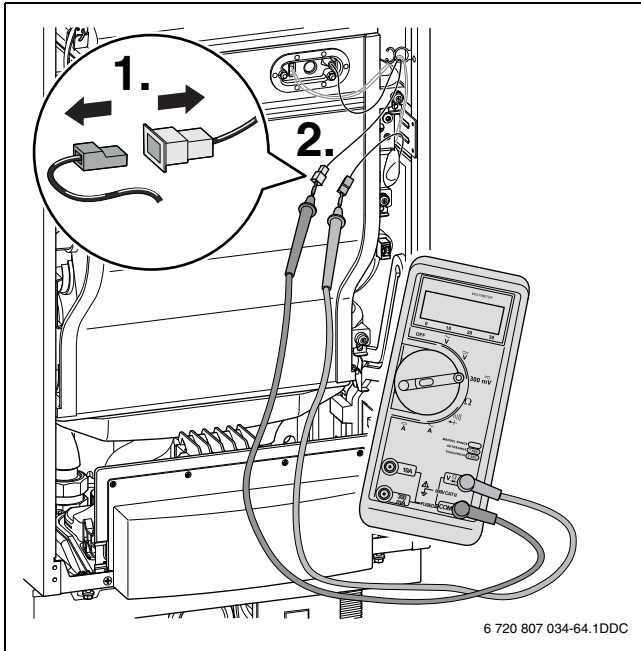


Fig. 73 Connecting the multi-meter

- ▶ Select the μA measurement value at the multi-meter.
- ▶ Bring the boiler into operation.
- ▶ Make sure that the boiler can dissipate the heat generated.
- ▶ Start the chimney sweep mode (\rightarrow Chapter 7.3).
- ▶ Set the smallest possible output value in % (partial load).
- ▶ Measure the ionisation current.



The ionisation current must be at least $3 \mu\text{A}$.

- ▶ If the value is lower, check the gas/air ratio and the monitoring electrode.

- ▶ Enter the value in the maintenance protocol (\rightarrow Chapter 11.15).
- ▶ Switch off the chimney sweep mode.
- ▶ Take the boiler out of operation.
- ▶ Remove the multi-meter.
- ▶ Re-connect the ionisation plugs.
- ▶ Bring the boiler into operation.

8.11 Testing for gas leaks



NOTICE: Damage to the boiler due to short-circuit.

- ▶ When using leak detection spray, cover the plug and cables.

- ▶ Start the chimney sweep mode (\rightarrow Chapter 7.3).
- ▶ As soon as the burner is on, check all gas-carrying components using an approved gas leak detection spray.

- ▶ Check the rubber gasket [1] at the ignition unit and the monitoring electrode for tightness.

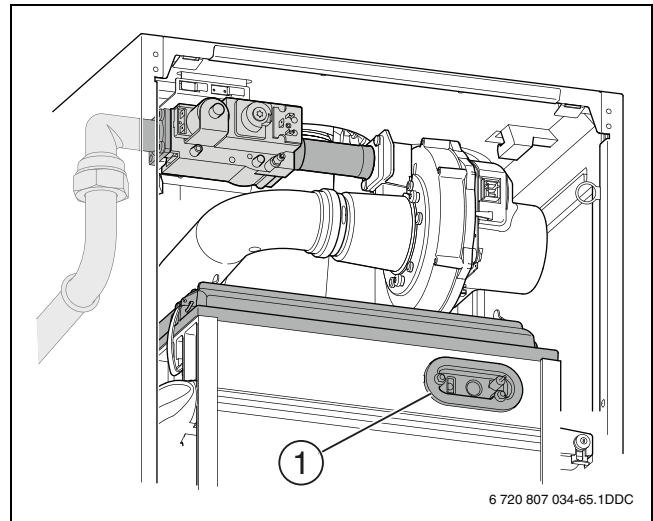


Fig. 74 Inspecting the gas train

- ▶ Determine the cause of a possible leak.
- ▶ Take steps to remedy the leak.
- ▶ Exit the chimney sweep mode.

8.12 Check the operating characteristics of the boiler

- ▶ Create a heat demand and check whether the boiler starts burning after several minutes to support the boiler operation.
- ▶ If applicable: open a DHW tap and check the DHW temperature and DHW volume.

8.13 Final steps

- ▶ Fit the casing.
- ▶ Complete the Benchmark checklist (50-V2 and 65-V2) or commissioning report (85-V2 and 100-V2).
- ▶ Place second ID sticker [1] (part of the documentation set) at the bottom right on the front cover.

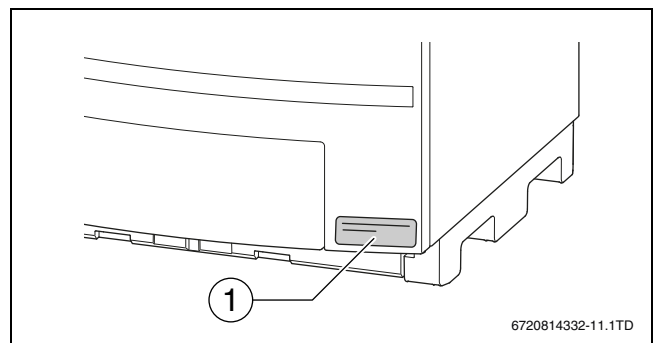


Fig. 75 Second ID sticker

8.14 Inform the user

- ▶ Familiarise the user with the heating system and operation of the boiler.
- ▶ Explain to the user how the heating system must be filled.
- ▶ Point out to the user that they must not carry out conversions, repairs or maintenance themselves.
- ▶ Fill out the commissioning report to confirm commissioning (\rightarrow Chapter 8.15).
- ▶ Hand the technical documentation to the user.

8.15 Commissioning report (for installations below 70 kW)

- ▶ Sign all completed commissioning work and enter the date.

Commissioning steps	Page	Measured values	Remarks
1. Filling and venting the heating system. • Expansion vessel pre-charge pressure (observe the installation instructions for the expansion vessel) • Heating system fill pressure	32 8	<input type="checkbox"/> _____ bar <input type="checkbox"/> _____ bar	
2. Check gas type against the data plate.	9	<input type="checkbox"/>	
3. Vent the gas line.	32	<input type="checkbox"/>	
4. Check the combustion air/flue gas connection.	32	<input type="checkbox"/>	
5. Adjusting the boiler: • Adjust the output • Adjust the flow temperature • Setting pump run-on time	32 32 32	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
6. Measure the gas supply pressure.	32	<input type="checkbox"/>	
7. Measure gas/air ratio	33	<input type="checkbox"/>	
8. Measure the CO ₂ content.	34	<input type="checkbox"/>	
9. Check the gas tightness.	36	<input type="checkbox"/>	
10. Check the flue gas tightness.	36	<input type="checkbox"/>	
11. Check the function of the boiler.	36	<input type="checkbox"/>	
12. Fitting the casing.	36	<input type="checkbox"/>	
13. Instruct the user, hand over technical documentation.	36	<input type="checkbox"/>	
Confirm professional commissioning:			
			Company stamp/ signature/date

Table 17 Commissioning report

9 Shutdown

9.1 Standard shutdown

- ▶ Take the boiler out of operation via the on/off switch.
- ▶ Close the gas isolation valve.
- ▶ Close the flow and return isolation valves.

9.2 Shutting down when there is a risk of frost

If the boiler stays on:

- ▶ Set the pump overrun time to 24 hours (→ Chapter 7.2 “Setup menu”).
- ▶ Make sure that a sufficient flow is possible at all radiators.

If the boiler is switched off:

- ▶ Take the boiler out of operation via the on/off switch.
- ▶ Close the gas isolation valve.
- ▶ Drain the entire heating system.
- ▶ If installed, drain the entire potable water system.

10 Environmental protection

Environmental protection is one of the principal policies for Worcester. We regard quality of performance, economy and environmental protection as equal objectives. Environmental protection laws and regulations are strictly adhered to.

To protect the environment, we use the best possible technology and materials taking into account cost effectiveness.

Packaging

Where packaging is concerned, we participate in country-specific recycling processes that ensure optimum recycling. All packaging materials are environmentally compatible and can be recycled.

Used appliances

Old appliances contain materials that should be recycled. The assemblies are easily separated and the types of plastic are clearly marked. In this way the individual assemblies can be easily sorted and directed to recycling or disposal.

11 Inspection and servicing

To safeguard the efficiency of the boiler and avoid possible technical problems, the boiler must be inspected and serviced at least once a year.



WARNING: Gas explosion.

- ▶ Turn off gas valve before working on gas-carrying components. Guard against unintentional re-connection.
- ▶ Check for leaks before working on gas-carrying components.



WARNING: flue gas poisoning.

- ▶ Check flue integrity for leaks before working on gas-carrying components.



CAUTION: Risk of electric shock

- ▶ When performing measurements and adjustments at the boiler, never touch the burner control unit, fan or pump. These are 230 V parts.
- ▶ Always isolate the boiler from the power supply before working on the electrical parts. Guard against unintentional re-connection.

11.1 Important information

You will need the following measuring devices and tools:

- Pressure gauge with a measurement accuracy of 0.01 mbar.
- ▶ Use only original spare parts.
- ▶ When carrying out the work, check all removed gaskets for damage, deformation or ageing and replace if necessary.

11.2 Remove the gas-air unit

- ▶ Remove the mains plug and control signal to the fan.

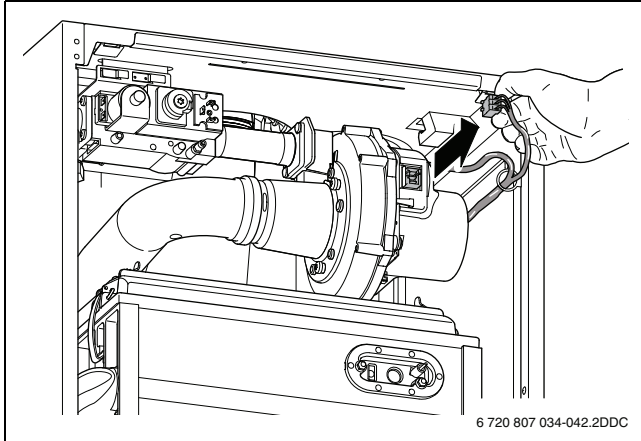


Fig. 76 Removing the mains plug of the fan

- ▶ Remove the gas supply pipe.

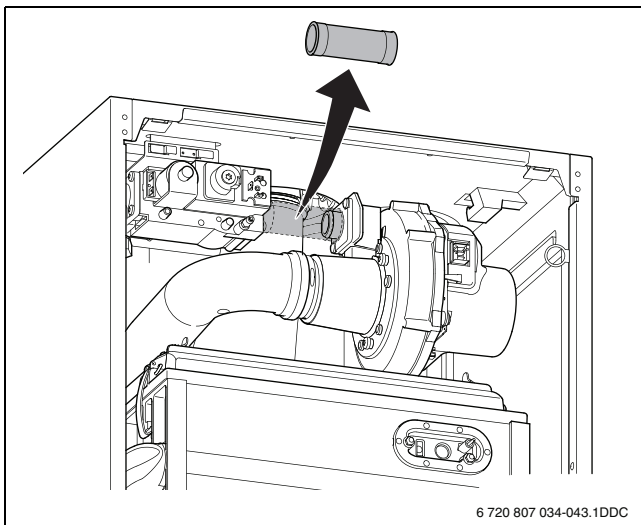


Fig. 77 Removing the gas supply pipe

- ▶ Remove the air intake pipe from the fan.

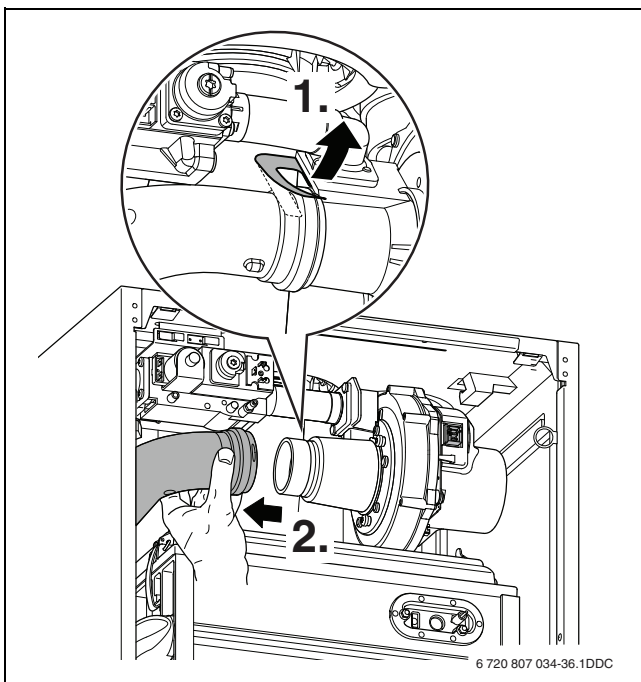


Fig. 78 Detaching the air intake pipe (Pictured: 50/65kW)

- ▶ Release the 4 snap fasteners on the burner cover. The snap fasteners are under tension.

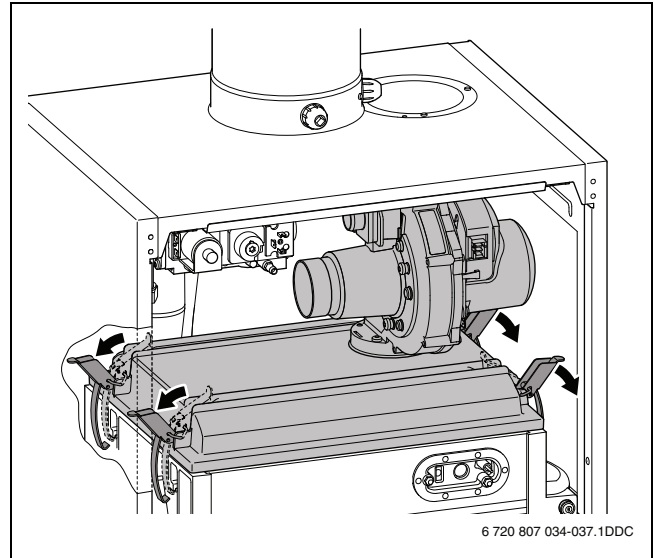


Fig. 79 Opening the snap fasteners

- ▶ Remove the gas-air unit together with the burner cover.

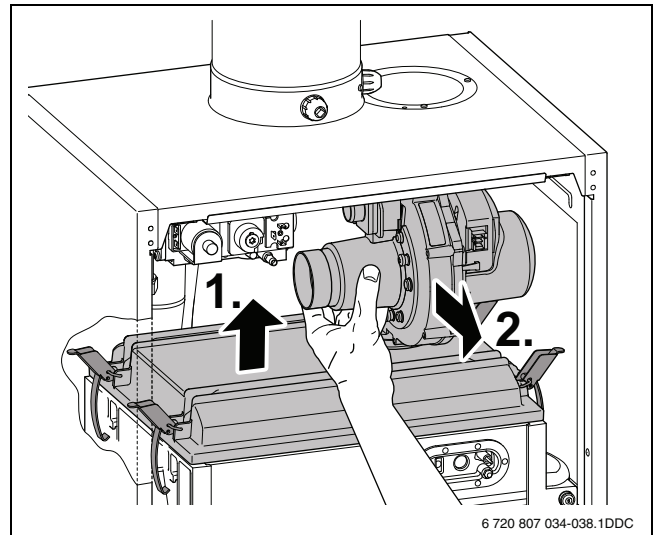


Fig. 80 Remove the gas-air unit together with the burner cover

11.3 To clean the burner

- ▶ Remove the burner gasket and replace if necessary.

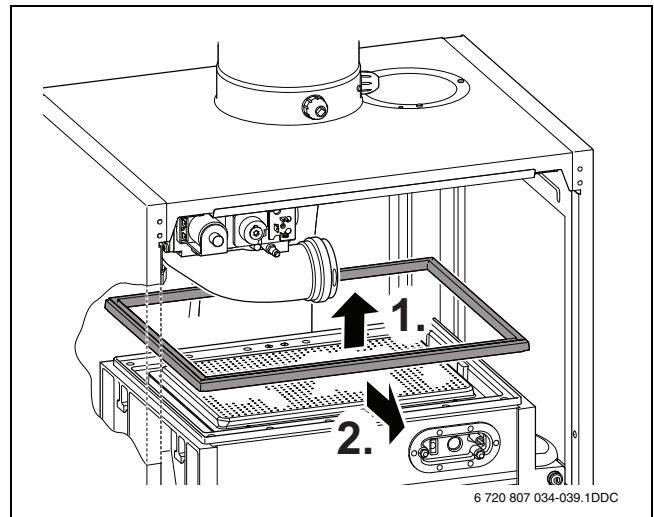


Fig. 81 Removing the burner gasket

- ▶ Take off the burner.

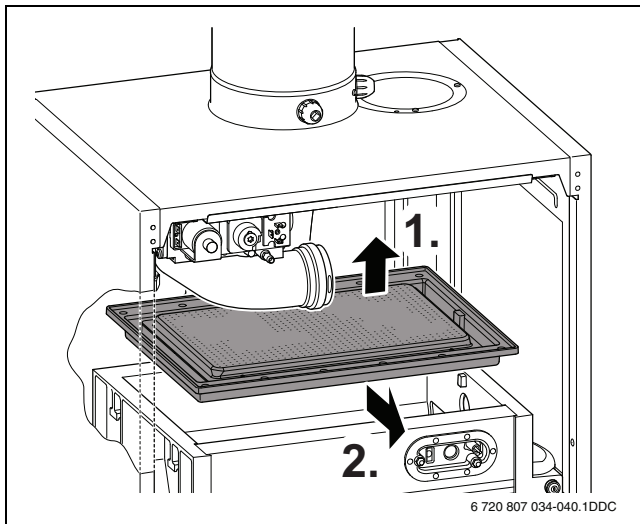


Fig. 82 Removing the burner

- ▶ Check the burner and gas distributor plate for soiling and cracking.
- ▶ Clean the burner with compressed air or a soft brush if necessary.
- ▶ Avoid touching the burner surface.

11.4 Cleaning the heat exchanger

NOTICE: Damage to the boiler.

- ▶ The heat exchanger has been coated. This coating must not be damaged.
- ▶ Steel brushes, abrasives or similar must therefore not be used when cleaning the various components.

- ▶ Cover the ignition device.
- ▶ Clean the heat exchanger by flushing with water or blowing through compressed air.
- ▶ Rinse the heat exchanger with water if necessary.

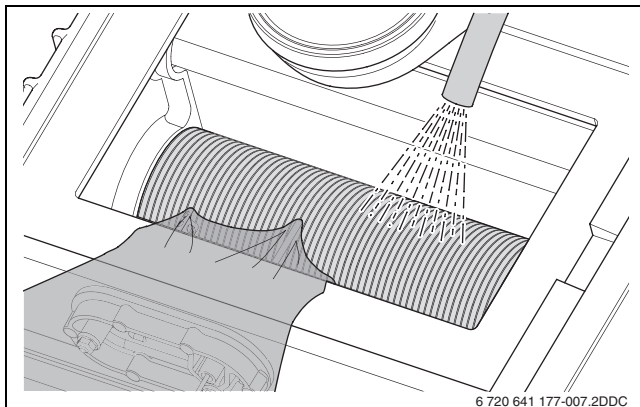


Fig. 83 Cleaning the heat exchanger

11.5 Checking the ignition system

NOTICE: Damage to the glow ignitor.

The glow ignitor unit is made of breakable material.

- ▶ Handle with care.

NOTICE: Damage to the boiler.

Since the effectiveness of the gaskets in the ignition device is reduced, the boiler may be damaged.

- ▶ Replace the gasket (→ figure 85, [3]) and cover plate with gasket (→ figure 85, [4]) every 4 years.

- ▶ Check the ignition device for wear, damage and soiling.

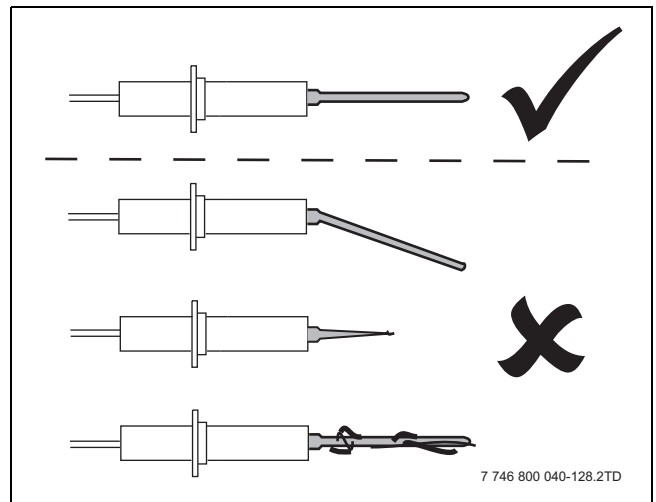


Fig. 84 Checking the monitoring electrode

- ▶ When replacing the monitoring electrode or glow ignitor unit, fit a new cover plate with gasket [4] and gasket [3].

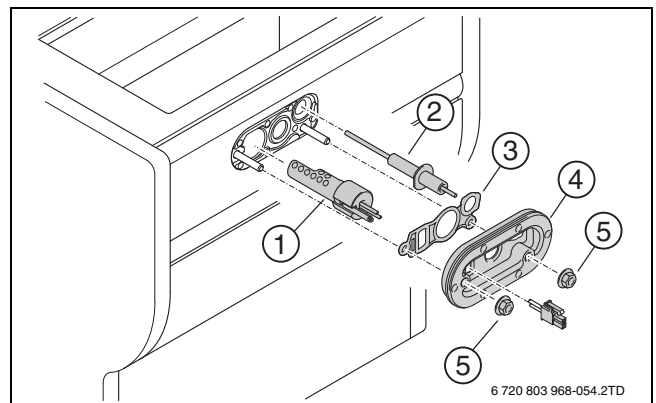


Fig. 85 Replacing the ignition device

- [1] Glow ignitor
- [2] Flame sense electrode
- [3] Seal
- [4] Cover plate with gasket
- [5] Nut

- ▶ Insert the burner [1] with the notch pointing to the right [3].

- ▶ Align gasket [2] carefully on the burner.

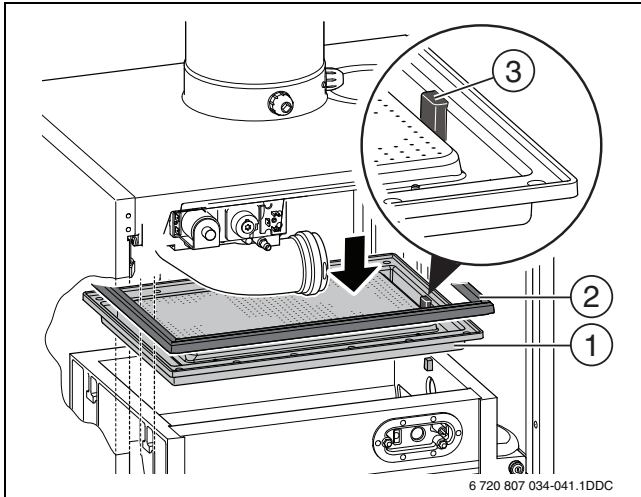


Fig. 86 Inserting the burner with gasket

- [1] Burner
- [2] Seal
- [3] Notch

- ▶ Reinstall the burner cover with gas-air unit in reverse order.

11.6 Clean condensate trap/siphon

- ▶ Detach the flexible hose, and also the tee if necessary, from the condensate trap.
- ▶ Screw the threaded connector [1] completely into the boiler.
- ▶ Remove the condensate trap [2].

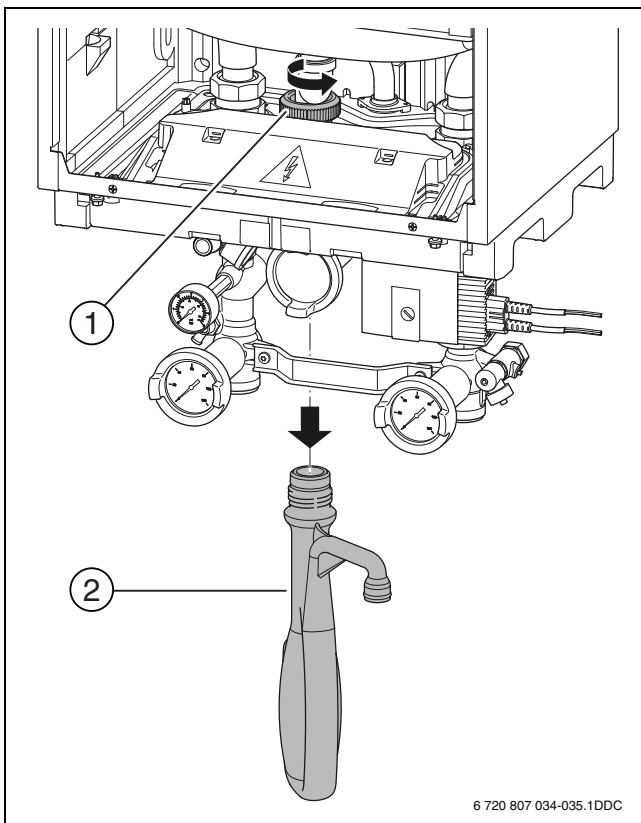


Fig. 87 Removing the condensate trap

- [1] Threaded connector
- [2] Condensate trap

- ▶ Flush out condensate trap.
- ▶ Fill the siphon completely with water.
- ▶ Reattach the siphon.
- ▶ Hand tighten the threaded connector.

11.7 Cleaning the condensate sump

If the siphon is soiled, check and clean the condensate sump as necessary.

- ▶ Pull the condensate hose down and turn it towards the rear.

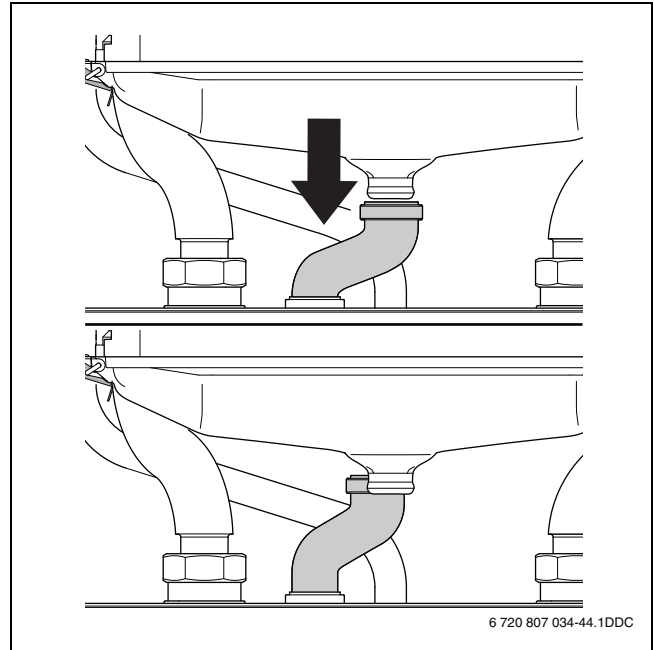


Fig. 88 Remove the condensate hose

- ▶ Release the 2 snap fasteners.

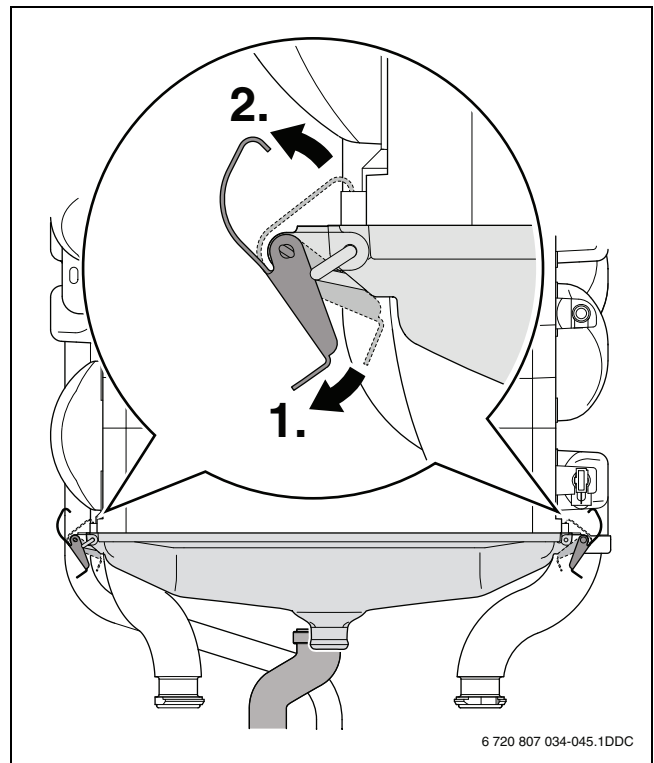


Fig. 89 Opening the snap fasteners of the condensate sump

- ▶ Remove condensate sump.

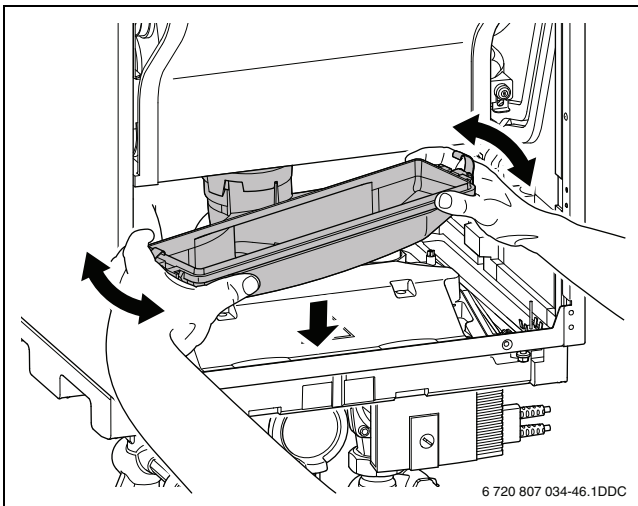


Fig. 90 Removing the condensate sump

- ▶ Clean the condensate sump.
- ▶ Check the gasket between the condensate sump and heat exchanger for damage and replace if necessary.
- ▶ Place the condensate sump under the heat exchanger.
- ▶ Push the condensate sump completely up to the heat exchanger.
- ▶ Close the snap fasteners.
- ▶ Reinsert all components in the reverse order.
- ▶ Bring the boiler into operation.
- ▶ Check the various gaskets at the condensate sump during operation for flue gas and condensate leaks.

11.8 Testing the gas supply pressure

See chapter 8.7 "Testing the gas supply pressure".

11.9 Measure gas/air ratio

- ▶ Take the boiler out of operation.
- ▶ Close the gas isolation valve.
- ▶ Undo the pressure test nipple nozzle [1] by turning it through 2 revolutions.

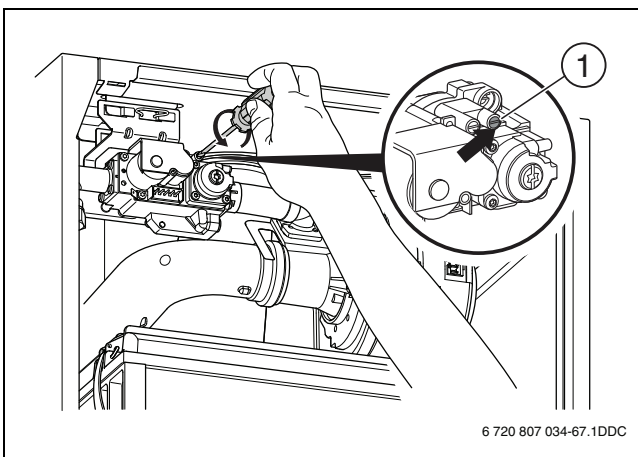


Fig. 91 Opening the burner pressure test nipple (50-V2 and 65-V2)

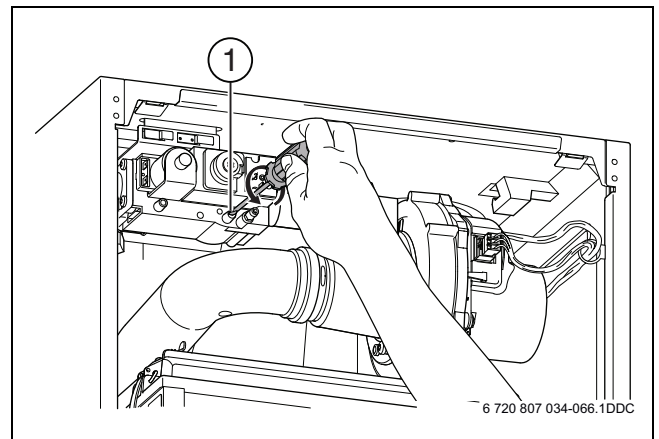


Fig. 92 Opening the burner pressure test nipple (85-V2 and 100-V2)

- ▶ Connect pressure gauge.
- ▶ Set pressure gauge to "0".
Hold the pressure gauge at the same height when the measurement is in progress.
- ▶ Open the gas isolation valve.
- ▶ Bring the boiler into operation.
- ▶ Make sure that the boiler can dissipate the heat generated.
- ▶ Start the chimney sweep mode (→ Chapter 7.3).
- ▶ Set the lowest possible output value (partial load).
- ▶ Measure the gas/air ratio.

This differential pressure must be between -10 and 0 Pa (-0.10 and 0.00 mbar) at minimum load. The nominal differential pressure is -5 Pa (-0.05 mbar).

- ▶ Remove the cap of the adjusting screw.
- ▶ Set the gas/air ratio to -5 Pa (-0.05 mbar).

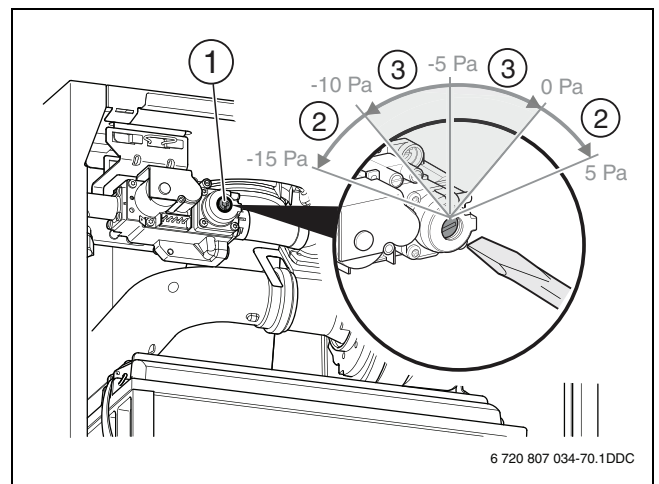


Fig. 93 Setting the gas/air ratio (50-V2 and 65-V2)

- [1] Cap
- [2] Differential pressure incorrect
- [3] Differential pressure correct

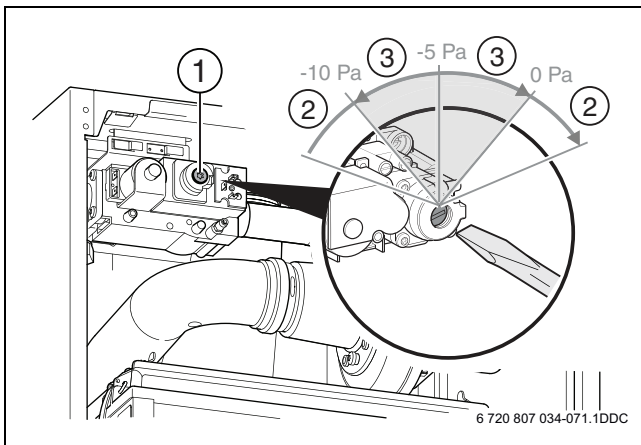


Fig. 94 Setting the gas/air ratio (85-V2 and 100-V2)

- [1] Cap
- [2] Differential pressure incorrect
- [3] Differential pressure correct
- ▶ Enter the measurement in the maintenance protocol (→ Chapter 11.15, page 43).
- ▶ Switch off the chimney sweep mode.
- ▶ Take the boiler out of operation.
- ▶ Close the gas isolation valve.
- ▶ Remove the pressure gauge.
- ▶ Close the test nipple.
- ▶ Replace the cap on the adjusting screw.
- ▶ Open the gas isolation valve.
- ▶ Bring the boiler into operation.

11.10 Measure CO/CO₂ content

See chapter 8.9 “Measure the CO and CO₂ content”.

11.11 Check flue gas non-return valve

If the boiler has been installed within an overpressure flue cascade system, the flue gas non-return valve must be checked.

- ▶ Open the inspection aperture [1] of the flue gas turret.
- ▶ Check the flue gas non-return valve [2] for wear, damage or soiling and replace if necessary.
- ▶ Close the inspection aperture of the flue gas non-return valve.

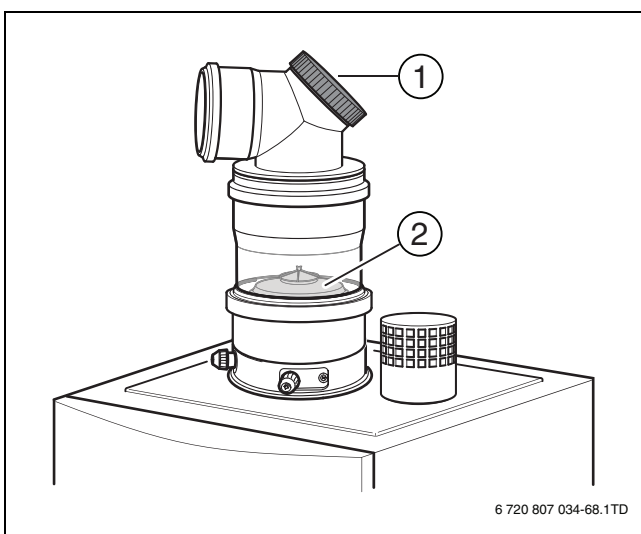


Fig. 95 Checking the flue gas non-return valve

- [1] Inspection aperture
- [2] Flue gas non-return valve

11.12 Measure ionisation current

See chapter 8.10 “Measure ionisation current”.

11.13 Testing for gas leaks

See chapter 8.11 “Testing for gas leaks”.

11.14 Check for correct operating characteristics

- ▶ Check all fittings for leaks.
- ▶ Check the system pressure of the boiler and top up if necessary. In doing so, take the water quality into account (→ Chapter 3.2).
- ▶ Check the boiler settings (→ Chapter 7.2 “Setup menu”).
- ▶ Replace the front casing and tighten the retaining screws.

11.15 Inspection and maintenance reports

Inspection work		Date:	Date:	Date:	Date:	Date:	Date:
1.	Check the general condition of the heating system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Carry out a visual inspection and function check of the heating system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	Check the system components in contact with gas and water for the following: • tightness during operation • visible signs of corrosion • signs of ageing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Check the burner, ignition and monitoring electrodes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.	Measure the gas supply pressure.	___ mbar	___ mbar	___ mbar	___ mbar	___ mbar	___ mbar
6.	Measure gas/air ratio	___ Pa	___ Pa	___ Pa	___ Pa	___ Pa	___ Pa
7.	Carry out a tightness test during operation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.	Measure the CO content (flue gas analysis).	___ ppm	___ ppm	___ ppm	___ ppm	___ ppm	___ ppm
9.	Measure the ionisation current.	___ µA	___ µA	___ µA	___ µA	___ µA	___ µA
10.	Check the charge pressure:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	– Check the charge pressure of the heating system.	___ bar	___ bar	___ bar	___ bar	___ bar	___ bar
11.	Check the combustion air supply and flue gas routing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12.	Check that the control is set correctly. ▶ Consult the instruction manual of the controller.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13.	Final inspection check, take measurements and document measurement and test results.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Confirm correct inspection						
Company stamp/signature/date							

Table 18 Inspection and maintenance reports



12 Display codes

Display codes give an indication of the operating condition of the boiler. Fault codes are either shown in the display directly or can be called up via the information menu. Proceed as follows:

- ▶ Open the information menu (→ Chapter 7.1, page 30).
- ▶ Switch to the fault code level in the information menu.
- ▶ Read out the fault code and look up meaning (→ tab. 19).

12.1 Code types in the display

There are 3 types of code:

- – Normal operating code
-  Blocking fault code
-  Interlocking fault code

12.3 Operating and fault codes



Code	Code type	Designation	Remedy
-- 2 0 8		The boiler is in chimney sweep mode.	
-- 2 0 0		The boiler is in heating mode.	
-- 2 0 1		The boiler is in DHW mode.	
-- 2 0 2		The boiler is waiting. There was a heat demand from the on/off or modulating control more frequently than 1x every 10 minutes.	
-- 2 0 3		The boiler is on standby.	
-- 2 0 4		The boiler is waiting. The actual flow temperature is higher than the calculated or selected boiler temperature.	<ul style="list-style-type: none"> ▶ Check the boiler temperature on the boiler display. Increase the above if necessary. ▶ Check the heating curve that has been set once the weather-dependent control has been adjusted. Increase the above if necessary. ▶ Check the wiring and function of the cylinder temperature sensor. Replace the component if necessary.
-- 2 1 2		The actual temperature recorded by the flow temperature sensor or the safety sensor is rising too quickly.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the operating characteristics and cabling of the pump and corresponding sensor. Replace the component if necessary.
-- 2 2 6		Diagnosis tool was connected.	
-- 2 6 0		The flow temperature sensor is not detecting a rise in temperature following a burner start.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the cabling and operating characteristics of the pump and the flow temperature sensor. Replace the component if necessary.
-- 2 6 5		The boiler is waiting. In response to a heat demand, the boiler regularly switches to partial load.	
-- 2 6 8		Component test phase.	
-- 2 7 0		The boiler is modulating upwards.	
-- 2 8 3		The boiler is preparing for a burner start. The fan and pump are activated.	
-- 2 8 4		The gas valve is switched.	
-- 3 0 5		The boiler waits after DHW operation ends.	
9 R 2 3 5		The KIM is too new for the burner control unit.	▶ Replace the burner control unit with a model on which the most up-to-date version of the software is installed. The software version is specified on the barcode of the burner control unit.
9 R 3 6 0		The KIM that has been fitted is not compatible with the burner control unit.	<ul style="list-style-type: none"> ▶ Check the KIM number. ▶ Fit a KIM with the correct KIM number.

Table 19 Operating and fault codes

12.2 Reset

For safety reasons, the boiler shuts down and locks as soon as a serious fault occurs. The fault code flashes to indicate this. The boiler must be reset in order to unlock it. Proceed as follows:

- ▶ Press the “reset” key (→ figure 61, [2], page 29), until “rE” appears in the display.

Generally, the boiler will operate normally again after a reset.

However, in some cases the underlying fault must first be remedied.

Code	Code type	Designation	Remedy
9 R 361	🔒	The burner control unit that has been fitted is not compatible with the KIM.	<ul style="list-style-type: none"> ▶ Check the numbers on the burner control unit. ▶ Fit a KIM with the correct KIM number.
9 U 233	🔒	The burner control unit or the KIM is faulty.	<ul style="list-style-type: none"> ▶ Check plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
R 3 317	🔒	Short circuit in the flue gas temperature sensor contacts.	<ul style="list-style-type: none"> ▶ Check the function of the flue gas temperature sensor by replacing the component.
b 7 257	🔒	The burner control unit or the KIM is faulty.	<ul style="list-style-type: none"> ▶ Check plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
C 1 264	🔌	No control signal or power supply to the fan during operation.	<ul style="list-style-type: none"> ▶ Check plug and cabling of the fan. ▶ Check the function of the fan, replace the component if necessary.
C 4 273	🔌	The boiler was switched off for a maximum of 2 minutes because it had been operating continuously for more than 24 hours. This is a safety check.	
C 6 215	🔒	The fan speed is too high.	<ul style="list-style-type: none"> ▶ Check plug and cabling of the fan.
C 6 216	🔒	The fan speed is too low.	<ul style="list-style-type: none"> ▶ Check the operating characteristics of the boiler by replacing the fan.
C 7 214	🔒	The fan does not run during the start phase (– –).	<ul style="list-style-type: none"> ▶ Check the plug of the burner control unit.
C 7 217	🔒	The fan speed is irregular when starting up.	<ul style="list-style-type: none"> ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
C E 207	🔌	Water pressure is too low.	<ul style="list-style-type: none"> ▶ Top up heating system with water until a pressure of 2 bar is reached. ▶ Check the expansion vessel. ▶ Check the heating system for leaks. ▶ Check the wiring and function of the pressure sensor.
C E 266	🔒	Pump test failed.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check function of the pump. ▶ Check function and cabling of the pressure sensor. ▶ Check the operating characteristics of the boiler by replacing the faulty component.
d 1 240	🔒	The contacts of the boiler return temperature sensor have short-circuited.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler.
d 1 241	🔒	The contacts of the boiler return temperature sensor have been interrupted.	<ul style="list-style-type: none"> ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check plug and cabling of the boiler return temperature sensor. ▶ Check the function of the boiler by replacing the boiler return temperature sensor.
d 3 232		The external switching contact has opened.	<ul style="list-style-type: none"> ▶ Check the jumper at the connection of the external switching contact. ▶ Check the external switching contact.
d 4 213		The actual temperature recorded by the flow temperature sensor or return temperature sensor is rising too quickly.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the cabling to the pump and corresponding sensors. Replace the faulty component if necessary.
d 4 277	🔌	Actual temperature differential between flow and safety temperature sensor is too high.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the operating characteristics and cabling of the pump and corresponding sensor. Replace the faulty component if necessary.

Table 19 Operating and fault codes














Code	Code type	Designation	Remedy
d 4 2 8 6		The boiler return temperature sensor has detected a return temperature higher than 105 °C.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check plug and cabling of the boiler return temperature sensor. ▶ Check the function of the boiler by replacing the boiler return temperature sensor.
E 2 2 2 2		Short circuit in the flow temperature sensor contacts.	<ul style="list-style-type: none"> ▶ Check the plug of the sensor. ▶ Check the operating characteristics of the boiler by replacing the sensor.
E 2 2 2 3		The flow temperature sensor contacts have been interrupted.	
E 5 2 1 8		The temperature captured by the flow temperature sensor exceeds 105 °C.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the operating characteristics of the pump and the flow temperature sensor. Replace the faulty component if necessary.
E 9 2 1 0		The temperature measured by the flue gas sensor is too high and it is open.	<ul style="list-style-type: none"> ▶ Check the function of the flue gas sensor. Replace if necessary. ▶ Check the boiler for soiling. Carry out a service if necessary. ▶ Check, via the flue inspection elbow, the seating of the flue gas non-return valve. Check for obstruction.
E 9 2 1 9		The safety temperature sensor has captured a temperature in excess of 105 °C.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the operating characteristics of the pump and the sensor. Replace the faulty component if necessary.
E 9 2 2 0		The contacts for the safety temperature sensor have shorted or the safety temperature sensor has detected a temperature higher than 130 °C.	
E 9 2 2 1		The contacts of the safety temperature sensor have been interrupted.	<ul style="list-style-type: none"> ▶ Check the plug of the sensor. ▶ Check the operating characteristics of the boiler by replacing the sensor.
E 9 2 2 4		The temperature measured by a device thermostat (e.g. maximum or burner thermostat) is too high and it is open.	<ul style="list-style-type: none"> ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the burner gaskets for flue gas leaks. Replace the faulty burner gaskets if necessary. ▶ Check the heat exchanger for soiling. ▶ Check the gas/air ratio.
E 9 2 7 6		The temperature measured by the flow temperature sensor exceeds 95 °C.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the cabling and function of pump and flow temperature sensor. Replace the faulty component if necessary.
E 9 2 7 7		The safety temperature sensor has measured a temperature in excess of 95 °C.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the cabling and function of the pump and safety temperature sensor. Replace the faulty component if necessary.
E 9 2 8 5		The boiler return temperature sensor has measured a temperature higher than 95 °C.	<ul style="list-style-type: none"> ▶ Check the water pressure of the boiler, vent the heating system and the boiler. ▶ Check whether it is possible to achieve sufficient flow in the heating system. ▶ Check the cabling and function of the pump and boiler return temperature sensor. Replace the faulty component if necessary.
E 9 3 1 8		The flue gas temperature sensor contacts have been interrupted.	<ul style="list-style-type: none"> ▶ Check the function of the flue gas temperature sensor. Replace if necessary.

Table 19 Operating and fault codes

Code	Code type	Designation	Remedy
E R 227	 + 	An insufficient ionisation current was measured following ignition of the burner.	<ul style="list-style-type: none"> ▶ Check the boiler for soiling. ▶ Check the gas supply pressure. ▶ Check the gas/air ratio. ▶ Check the plug of the ignition device. ▶ Check the ignition and ionisation current. ▶ Check the ignition device, including gaskets, for damage. Replace the faulty component if necessary.
E R 229		The ionisation current detected by the system during the burning phase was insufficient.	<ul style="list-style-type: none"> ▶ Check the dynamic gas supply pressure. ▶ Check plug and cabling of the ionisation pin. ▶ Check ignition device for damage and wear. Replace the component if necessary.
E R 234		The contacts of the gas valve have been interrupted.	<ul style="list-style-type: none"> ▶ Check 24V cabling for poor contacts, breaks and pinching. ▶ If installed: check the function of the boiler by connecting the appliance thermostats (e.g. maximum, flue gas or burner thermostat) one by one. Remove the connections after performing the check and replace the relevant appliance thermostats if necessary. ▶ Check the cabling and plug of the gas valve. ▶ Check the function of the boiler by replacing the gas valve. ▶ Check the plug and wiring of the burner control unit. ▶ Check the operating characteristics of boiler by replacing the burner control unit.
E R 261		The burner control unit is faulty.	<ul style="list-style-type: none"> ▶ Check the plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
E R 269		The ignition device has been activated for too long.	<ul style="list-style-type: none"> ▶ Check the plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
F 0 237		The burner control unit or the KIM is faulty.	<ul style="list-style-type: none"> ▶ Check the plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
F 0 238			
F 0 239		The burner control unit or the KIM is faulty.	<ul style="list-style-type: none"> ▶ Check the 24V cabling for poor contacts, breaks and pinching. If installed: check the function of the boiler by connecting the appliance thermostats (e.g. maximum, flue gas or burner thermostat) one by one. Remove the connections after performing the check and replace the relevant appliance thermostats if necessary. ▶ Check the plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
F 0 242		The burner control unit or the KIM is faulty.	<ul style="list-style-type: none"> ▶ Check the plug and wiring of the burner control unit. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
F 0 243			
F 0 244			
F 0 245			
F 0 246			
F 0 247			
F 0 248			
F 0 249			
F 0 250			
F 0 251			
F 0 252			
F 0 253			
F 0 255			
F 0 259			
F 0 263			
F 0 267			
F 0 272			

Table 19 Operating and fault codes









Code	Code type	Designation	Remedy
F 0 2 7 8		The sensor test has failed.	<ul style="list-style-type: none"> ▶ Check the cabling and plug of the sensors. ▶ Check the operating characteristics of the sensors. Replace the faulty component if necessary.
F 0 2 7 9		The burner control unit or the KIM is faulty.	▶ Check the plug and wiring of the burner control unit.
F 0 2 8 0		The burner control unit is faulty.	▶ Check the operating characteristics of the boiler by replacing the burner control unit.
F 0 2 8 7		The burner control unit or the KIM is faulty.	
F 0 2 9 0		The burner control unit or the KIM is faulty.	
F 7 2 2 8		An ionisation current was measured before the burner started.	<ul style="list-style-type: none"> ▶ Check the plug of the ionisation pin for damage and wear. ▶ Check the ignition device for damage and wear. Replace the faulty component, with gaskets, if necessary.
F 7 3 2 8		A brief power failure has occurred.	<ul style="list-style-type: none"> ▶ Check whether the fault may have been caused by the presence of a power unit, a wind turbine or other equipment that could cause an interruption. ▶ Check the electrical installation.
F R 3 0 6		An ionisation current was measured after the burner went out.	<ul style="list-style-type: none"> ▶ Inspect the ionising part of the ignition device. Replace the faulty component if necessary. ▶ Check whether the gas/air ratio upstream and downstream of the burner phase remains the same. ▶ Check whether voltage is present at the gas valve once the burner phase has expired. ▶ Check the operating characteristics of the boiler by replacing the burner control unit.
F d 2 3 1		The mains voltage was interrupted during an interlocking fault.	▶ Reset the boiler.
E C 2 5 6		The burner control unit or the KIM is faulty.	▶ Check plug and wiring of the burner control unit.
E H 2 5 8			▶ Check the operating characteristics of the boiler by replacing the burner control unit.
H 0 7		The current water pressure is too low. This limits the performance in heating mode as well as DHW mode.	<ul style="list-style-type: none"> ▶ Vent the heating system and the boiler. ▶ Refill the heating system.
H r E		The boiler is reset.	
r E		The boiler is reset.	

Table 19 Operating and fault codes

Notes

GAS BOILER SYSTEM COMMISSIONING CHECKLIST

This Commissioning Checklist is to be completed in full by the competent person who commissioned the boiler as a means of demonstrating compliance with the appropriate Building Regulations and then handed to the customer to keep for future reference.

Failure to install and commission according to the manufacturer's instructions and complete this Benchmark Commissioning Checklist will invalidate the warranty. This does not affect the customer's statutory rights.

Customer name:				Telephone number:			
Address:							
Boiler make and model:							
Boiler serial number:							
Commissioned by (PRINT NAME):				Gas Safe register number:			
Company name:				Telephone number:			
Company address:							
				Commissioning date:			
To be completed by the customer on receipt of a Building Regulations Compliance Certificate*							
Building Regulations Notification Number (if applicable):							
CONTROLS (tick the appropriate boxes)							
Time and temperature control to heating		Room thermostat and programmer/timer		Programmable room thermostat			
		Load/weather compensation		Optimum start control			
Time and temperature control to hot water		Cylinder thermostat and programmer/timer		Combination Boiler			
Heating zone valves		Fitted		Not required			
Hot water zone valves		Fitted		Not required			
Thermostatic radiator valves		Fitted		Not required			
Automatic bypass to system		Fitted		Not required			
Boiler interlock				Provided			
ALL SYSTEMS							
The system has been flushed and cleaned in accordance with BS7593 and boiler manufacturer's instructions						Yes	
What system cleaner was used?							
What inhibitor was used?						Quantity	
						litres	
Has a primary water system filter been installed?						Yes	
						No	
CENTRAL HEATING MODE measure and record:							
Gas rate		m ³ /hr		OR		ft ³ /hr	
Burner operating pressure (if applicable)		mbar		OR Gas inlet pressure		mbar	
Central heating flow temperature						°C	
Central heating return temperature						°C	
COMBINATION BOILERS ONLY							
Is the installation in a hard water area (above 200ppm)?						Yes	
						No	
If yes, and if required by the manufacturer, has a water scale reducer been fitted?						Yes	
						No	
What type of scale reducer has been fitted?							
DOMESTIC HOT WATER MODE Measure and Record:							
Gas rate		m ³ /hr		OR		ft ³ /hr	
Burner operating pressure (at maximum rate)		mbar		OR Gas inlet pressure at maximum rate		mbar	
Cold water inlet temperature						°C	
Hot water has been checked at all outlets						Yes	
						Temperature	
						°C	
Water flow rate						l/min	
CONDENSING BOILERS ONLY							
The condensate drain has been installed in accordance with the manufacturer's instructions and/or BS5546/BS6798						Yes	
ALL INSTALLATIONS							
Record the following:		At max. rate:		CO		ppm	
		AND		CO/CO ₂		Ratio	
		At min. rate: (where possible)		CO		ppm	
		AND		CO/CO ₂		Ratio	
The heating and hot water system complies with the appropriate Building Regulations						Yes	
The boiler and associated products have been installed and commissioned in accordance with the manufacturer's instructions						Yes	
The operation of the boiler and system controls have been demonstrated to and understood by the customer						Yes	
The manufacturer's literature, including Benchmark Checklist and Service Record, has been explained and left with the customer						Yes	
Commissioning Engineer's Signature							
Customer's Signature							
(To confirm satisfactory demonstration and receipt of manufacturer's literature)							

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.



SERVICE RECORD

It is recommended that your heating system is serviced regularly and that the appropriate Service Interval Record is completed.

Service Provider

Before completing the appropriate Service Record below, please ensure you have carried out the service as described in the manufacturer's instructions. Always use the manufacturer's specified spare part when replacing controls.

SERVICE 01					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 02					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 03					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 04					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 05					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 06					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 07					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 08					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 09					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

SERVICE 10					Date:
Engineer name:					
Company name:					
Telephone No:					
Gas safe register No:					
Record:	At max. rate:	CO	ppm	AND	CO ₂ %
	At min. rate: (Where Possible)	CO	ppm	AND	CO ₂ %
Comments:					
Signature					

*All installations in England and Wales must be notified to Local Authority Building Control (LABC) either directly or through a Competent Persons Scheme. A Building Regulations Compliance Certificate will then be issued to the customer.



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