INSTALLATION, COMMISSIONING AND SERVICING INSTRUCTIONS

WALL HUNG RSF GAS FIRED CONDENSING REGULAR BOILER

Greenstar Ri Compact

FOR OPEN VENTED AND SEALED CENTRAL HEATING SYSTEMS AND
INDIRECT MAINS FED DOMESTIC HOT WATER

6720646610-00.1Wo

These appliances are for use with: Natural Gas or L.P.G. (Cat. II 2H 3P type C13, C33 & C53)		
	Model	**GC Number**
Natural Gas	27Ri Compact	41-406-17
	30Ri Compact	41-406-19
L.P.G.	27Ri Compact	41-406-18
	30Ri Compact	41-406-20

UK/IE

benchmark
COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

WORCESTER
Bosch Group

6 720 646 610 (2013/12)

CONTENTS

1 KEY TO SYMBOLS AND SAFETY INSTRUCTIONS

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.

The following keywords are defined and can be 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

SYMBOLS USED IN THIS MANUAL

	Domestic Hot Water
	Central Heating
	Hot Water Storage Cylinder
	Domestic Cold Water Supply
	Electrical Supply
	Gas Supply

Table 2 Commonly used symbols

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 (0330 123 3366).
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.

Ø	Diameter
NG	Natural Gas
LPG	Liquid Petroleum Gas
CH	Central Heating
DHW	Domestic Hot Water
DCW	Domestic Cold Water
PRV	Pressure Relief Valve
NTC	Negative Temperature Coefficient (sensor)
IP	Ingress Protection
RCD	Residual Current Device
TRV	Thermostatic Radiator Valve
ECV	Emergency Control Valve
WRAS	Water Regulations Advisory Scheme
SEDBUK	Seasonal Efficiency of Domestic Boilers in the United Kingdom

Table 3 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 on 0800 111 999.
- ▶ L.P.G. boilers: Call the supplier's number on the side of the gas tank.

BOILER OPERATION:

This boiler must only be operated by a responsible adult who has been instructed in, understands, and is aware of the boiler's operating conditions and effects.

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.

The guarantee of this product is dependant on the Benchmark checklist being completed and the actions undertaken.

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 Hotwater 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).

COMBUSTION AND CORROSIVE MATERIALS

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

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

FITTING AND MODIFICATION

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

Only use Worcester, Bosch approved flue systems, no other manufacturer's flue systems have been approved for use with Worcester appliances.

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 guarantee. 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, IEE Regulations, Building Regulations, Building Standards (Scotland) (Consolidation), Building Regulations (Northern Ireland), local water by-laws, Health & Safety Document 635 (The Electricity at Work Regulations 1989) 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.

BS7074:1	Code of practice for domestic and hot water supply
BS6891	Installation of low pressure gas pipe work up to 28mm (R1)
BS5546	Installation of gas hot water supplies for domestic purposes
EN12828	Central heating for domestic premises
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
BS7593	Treatment of water in domestic hot water central heating systems
BS6798	Installation of gas fired boilers of rated input up to 70kW (net)

L.P.G. 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.

IRISH STANDARDS

The relevant Irish standards should be followed, including:

- ECTI National rules for electrical installations
- IS 813:2002 for Domestic Gas Installations.

BUILDING REGULATIONS PART L 1A 2010

If the installation is in a new build property or is a first time installation in an existing property, heating systems must conform to current building regulations Part L1a.

All new heating systems in dwellings must have at least two heating zones. Each of these zones will be operated separately by both time and temperature controls.

The exception to this are single storey, open plan dwellings where the living area is more than 70% of the total usable floor area. Then this type of dwelling can be controlled as one zone.

All radiators must have TRVs fitted, where reasonable, in all rooms except bathrooms and rooms with thermostats.

BUILDING REGULATIONS PART L 1B 2010 - BOILER REPLACEMENT

For boiler replacement on an existing system, it is not necessary to zone the system, compliance with the zone requirements can be achieved by a single room thermostat or programmable room thermostat.

CH WATER

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

APPLIANCE AND FLUE INSTALLATION

The appliance must be installed in such a manner so that:

- a service engineer has clear and safe access to work on the appliance, as described in the installation manual.
- the home owner has reasonable access to the appliance controls for adjustment and possible resetting or re-pressurising.

Loft cavities where appliances are fitted, must have:

- permanently fitted, lighting.
- permanently fitted, retractable loft ladder.
- fixed floor area sufficient to allow access for normal use and servicing directly under and around the appliance and between the appliance and the loft access hatch, as stated in the Gas Safety Installation regulations.

Adequate provision must be made for visual inspection of all flue connections or joints.

2 APPLIANCE INFORMATION

2.1 APPLIANCE

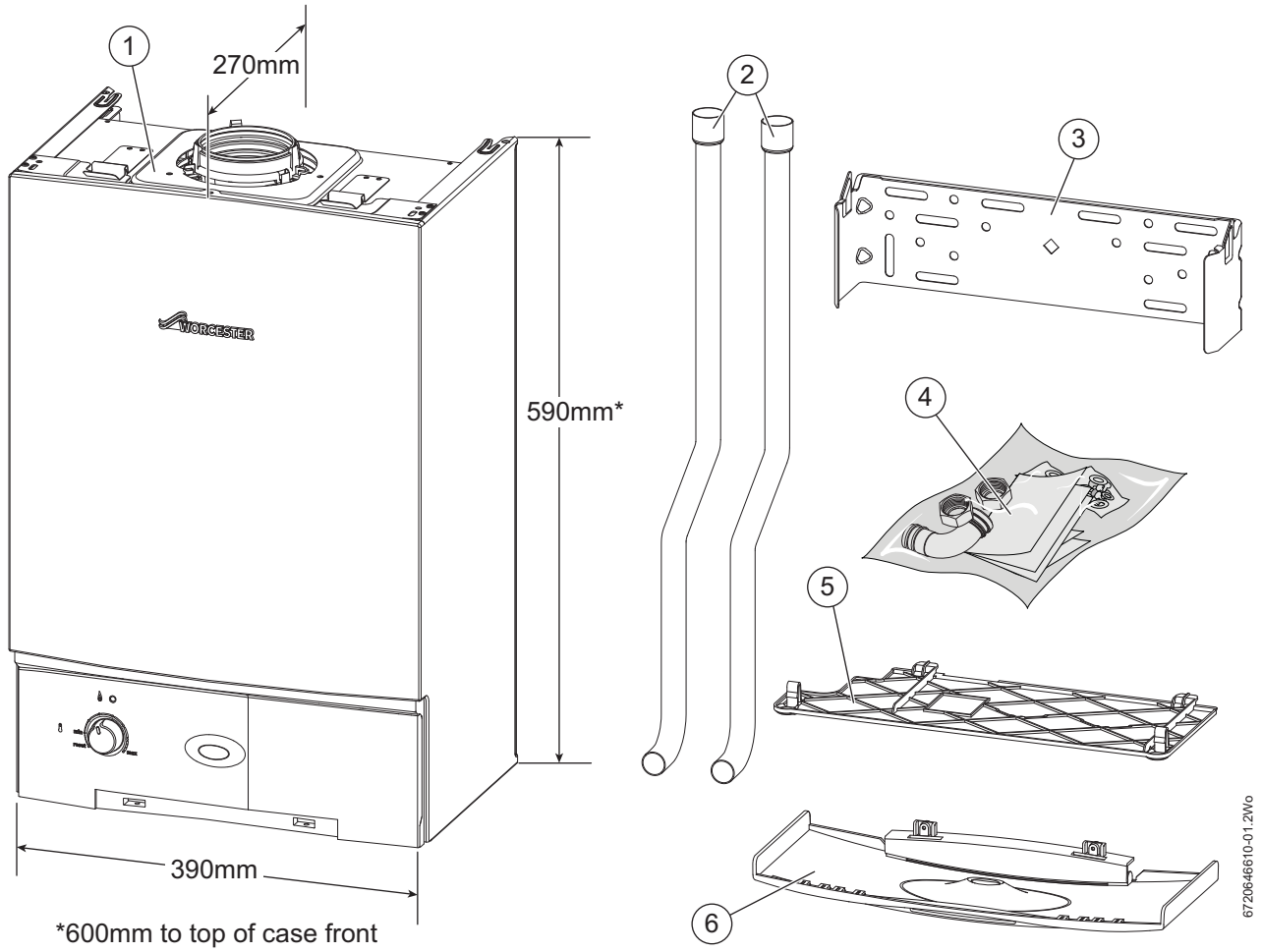


Fig. 1 Ri Compact standard package

STANDARD PACKAGE:	
1	Wall hung gas fired condensing regular boiler for central heating and domestic hot water
2	Tail pipes - water only
3	Wall plate
4	Hardware literature pack (see checklist)
5	Bottom panel
6	Fascia panel

BOILER FEATURES AND CHECKLIST

- Pre-wired and pre-plumbed
- Aluminium coated steel inner frame
- Digital control system
- Memory retention after power cut
- Automatic ignition
- Direct burner ignition electrodes
- Built-in frost protection
- Built-in fault finding diagnostics
- Fixed gas valve settings
- Combustion air fan with speed regulator
- CH temperature sensor & control
- Pump anti-seizure protection
- Flue gas temperature sensor
- Condensate siphonic trap

CHECK LIST - Hardware literature pack	Qty.
Greenstar Ri Compact Installation, Commissioning and Servicing Instructions	1
Users Instructions	1
Pipe condensate, elbow	1
Wall mounting template	1
Sealing Pack:	1
- Compression Nut 22mm	3
- Compression Ring 22mm	3
Screws (flap fixings)	2
Strain relief grommet	1

2.2 LAYOUT

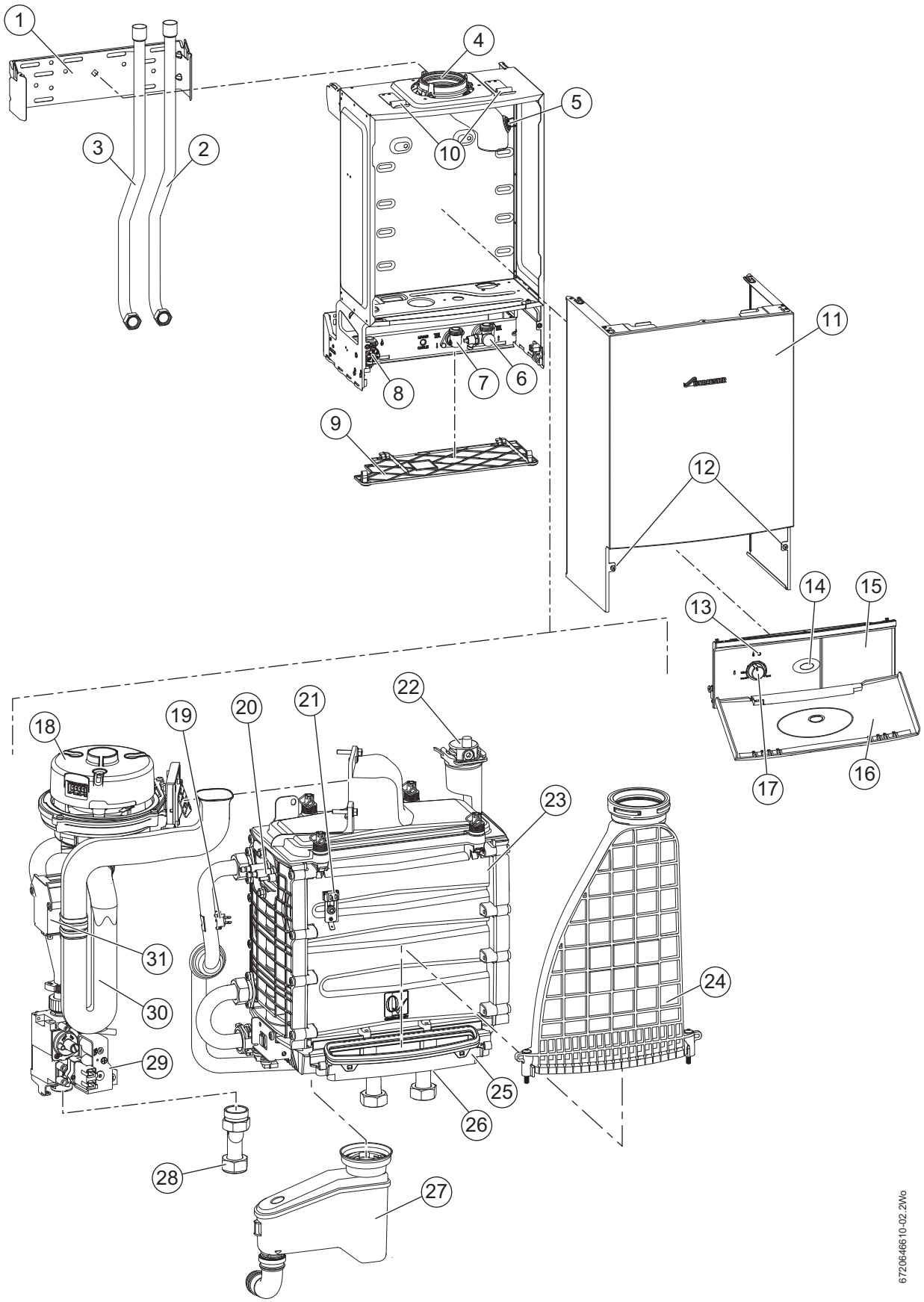


Fig. 2 Ri Compact main boiler components

1	Wall mounting frame	17	Temperature control and reset
2	Primary return pipe	18	Fan
3	Primary flow pipe	19	Flow temperature sensor (NTC)
4	Flue connector	20	Electrode assembly
5	Flue overheat thermostat	21	Maximum safety sensor (NTC)
6	Primary return connection	22	Auto air vent
7	Primary flow connection	23	Heat exchanger
8	Gas inlet isolator	24	Flueway
9	Bottom panel	25	Sump assembly
10	Case retaining clips	26	Return temperature sensor (NTC)
11	Case	27	Condensate siphon
12	Case fixing screws	28	Gas connection
13	Control panel	29	Gas valve
14	Operation/fault indicator (blue)	30	Air inlet
15	Blanking panel (for optional programmer)	31	Ignition transformer
16	Control panel flap		

Table 4 Main boiler components

2.3 TECHNICAL DATA

DESCRIPTION Ri Compact	UNIT	Natural Gas 27kW	Natural Gas 30kW	L.P.G. 27kW	L.P.G. 30kW
Gas flow rate - Max. 10 minutes from lighting					
Natural Gas G20	m^3/h	2.92	3.24		
Gas flow L.P.G.	kg/h			2.1	2.33
Central Heating					
Minimum heat input	kW	7.15	7.15	7.15	7.15
Maximum rated heat input (net)	kW	27.58	30.65	27.58	30.65
Maximum rated heat output 40/30 °C	kW	28.55	31.70	28.55	31.70
Maximum rated heat output 50/30 °C	kW	28.4	31.57	28.4	31.57
Maximum rated heat output 80/60 °C	kW	27.0	30.0	27.0	30.0
Maximum flow temperature	°C	82	82	82	82
Maximum permissible operating pressure	bar	2.5	2.5	2.5	2.5
Flue					
Flue gas temperature 80/60 °C, rated/min. load	°C	67/64	70/64	69/66	72/66
Flue gas temperature 40/30 °C, rated/min. load	°C	48/36	50/36	50/37	52/37
CO_2 level at max. rated heat output (after 30 minutes)	%	9.1	9.1	10.6	10.6
CO_2 level at min. rated heat output (after 30 minutes)	%	8.5	8.5	9.6	9.6
NOx class		5	5	5	5
NOx rating	mg/kWh	35	35	40	42
Condensate					
Maximum condensate rate	l/h	2.5	2.5	2.5	2.5
pH value, approx.		4.8	4.8	4.8	4.8
Electrical					
Electrical power supply voltage	a.c. V	230	230	230	230
Frequency	Hz	50	50	50	50
Maximum power consumption (without pump)	W	35	41	35	41
Maximum power consumption at standby		<1	<1	<1	<1
General data					
Appliance protection rating	IP	X4D	X4D	X4D	X4D
Permissible ambient temperatures	°C	0 - 50	0 - 50	0 - -50	0 - -50
Nominal capacity of appliance	litre	1.83	1.83	1.83	1.83
**Noise output level (Max central heating)	dBA	45.5	45.5	45.5	45.5
Total packaged weight	kg	31.0	31.0	31.0	31.0
Lift weight	kg	22.7	22.7	22.7	22.7
SEDBUK 2005	band	A	A	A	A
SEDBUK 2009	%	89.0	89.0	90.0	90.0

Table 5 Ri Compact technical data

** All Worcester Greenstar boilers are tested in an acoustic chamber to sound level and there may some differences in situ dependant on installation site i.e. corners of rooms, fabric of property walls.

3 PRE-INSTALLATION

3.1 CLEANING PRIMARY SYSTEMS

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

CAUTION:
- ▶ Isolate the mains electrical supply before starting any work and observe all relevant safety precautions.

NOTICE:
- ▶ Debris from the system can damage the boiler and reduce efficiency.
  Failure to comply with the guidelines for the use of water treatment with the appliance will invalidate the appliance warranty and contravene the Building Regulations.
- ▶ It is recommended that you fit a primary water cleanser to the system. Worcester offers a filter that helps remove both magnetite and non-magnetic debris.
  Part number 7 716 192 609

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.**

FOLLOW THE GUIDANCE OF BS7593:

Treatment of water in domestic hot water central heating and also the flushing guidelines below.

ARTIFICIALLY SOFTENED WATER

NOTICE: ARTIFICALLY SOFTENED WATER MUST NOT BE USED TO FILL THE CENTRAL HEATING SYSTEM.

It is possible to have an ion exchange water softener fitted to the cold water system of the property. However, the boiler requires an untreated cold water connection taken from the mains supply, before the water softener, to the primary water filling point of the heating system.
Alternatively there are water softening/treatment devices that do not adjust or alter the pH level of the water. With these devices it may not be necessary to provide an untreated water bypass to the primary water filling point of the heating system.

FLUSHING THE SYSTEM

- ▶ Fill the system with cold water and check for leaks.
- ▶ Open all drain cocks and drain the system.
- ▶ Close drain cocks and add a suitable flushing agent **compatible with aluminium** at the correct strength for the system conditions in accordance with the manufacturer's instructions.
  The pH value of the system water must be less than 8 or the appliance guarantee will be invalidated.
- ▶ Circulate the flushing agent before the boiler is fired up.
- ▶ Run the boiler/system at normal operating temperature as directed by the manufacturer of the flushing agent.
- ▶ Drain and thoroughly flush the system to remove the flushing agent and debris.
- ▶ It may be necessary to use a power flushing machine to aid the cleansing procedure in some circumstances.
- ▶ Close the drain cocks and refill with fresh water and a suitable inhibitor.
- ▶ Vent any air from the boiler and system.

INHIBITOR

Add a suitable inhibitor or combined inhibitor/anti-freeze, if the system is exposed to freezing conditions, to the heating system in accordance with the DWTA code of practice and manufacturer's guidelines.

WARNING: Sealing agents
- ▶ The addition of sealing agents to the system water is not permitted as this can cause problems with deposits left in the heat exchanger.
- ▶ In cases where all attempts to find a micro leak have failed, Worcester, Bosch Group supports the use of Fernox F4 leak sealer.

WATER TREATMENT

Suitable water treatment products can be obtained from the following manufacturers:

FERNOX	0870 601 5000 - www.fernox.com
SENTINEL	0800 389 4670 - www.sentinel-solutions.net

3.2 MAINS SUPPLY

3.2.1 ELECTRICAL SUPPLY

- Supply: 230V - 50 Hz, 50 Watts plus pump
- Cable: PVC insulated 0.75mm^2 (24 x 0.2mm) temperature rated to 90 °C.
- External 3A fuse to BS1362.
- The appliance must be earthed.
- This appliance must **NOT** be connected to a three phase supply.
- IPX4D.
- Wiring must comply with the latest edition of BS 7671 (IEE wiring regulations).

3.2.2 GAS SUPPLY

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, the following applies:

- 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 boiler must be in accordance with BS6891.
- Under no circumstance should the size of the gas supply pipe be less than 22mm.
- The meter or regulator and pipe work to the meter must be checked, preferably by the gas supplier.

3.3 WATER SYSTEMS AND PIPE WORK

PLASTIC PIPE WORK:

- Any plastic pipe work must have a polymeric barrier with 600mm (minimum) length of copper pipe connected to the boiler.
- Plastic pipe work used for under-floor 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 be capable of sustaining a pressure up to 3 bar.
- Radiator valves should conform to BS2767:10.
- All other valves should conform to BS1010.
- Thermostatic radiator valves (TRV) must be used on all radiators within the sleeping accommodation but not the radiator where the room thermostat is sited. This must be fitted with lock-shield valves and left open.
- A drain cock is required at the lowest point in the system.
- An air vent is required at all the high points in the system.

SEALED PRIMARY SYSTEM:

NOTICE: ARTIFICALLY SOFTENED WATER MUST NOT BE USED TO FILL THE SYSTEM.

- If the system is sealed then the system must be filled using a WRAS approved filling loop or comply with figure 3 for system fill.
- The expansion vessel (2) must be fitted as close as possible to the appliance in the central heating return.
- **Do not use galvanised pipes or radiators**.

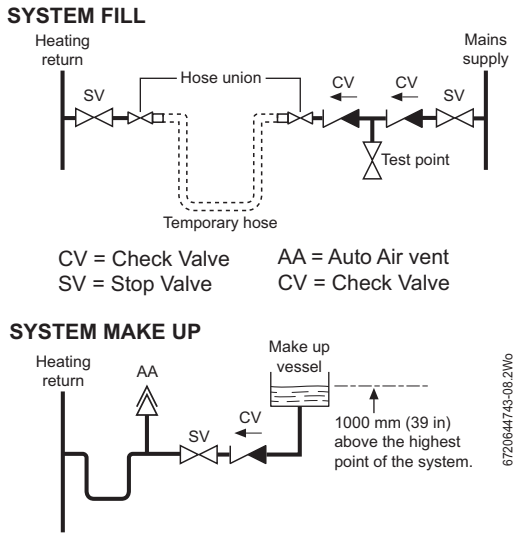


Fig. 3 System Fill

S AND Y PLAN SYSTEMS:

1	Static head - Minimum static head 250mm measured from the highest point in the heating system (top surface of the appliance or the highest point in the heating system) to the water level in the feed and expansion tank
2	Heating vent (22mm minimum)
3	Primary cold feed (15mm minimum)
4	Diverter valve and zone valve
5	Pump, maximum power 90 Watts
6	Automatic bypass
7	Radiator valve (Flow)
8	Lock shield valve (Return)
9	Expansion vessel
10	Pressure gauge
11	3 bar pressure relief valve
12	Stop cock

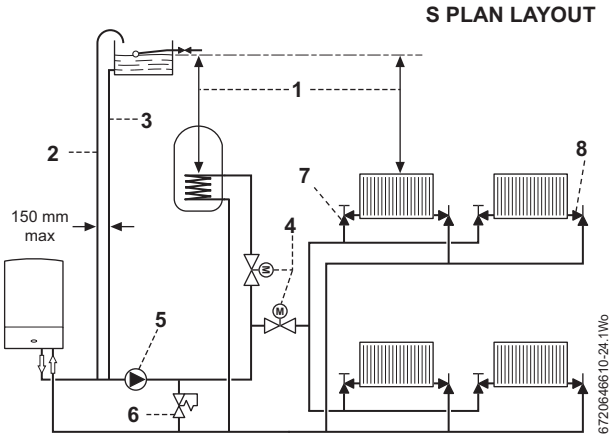
Table 6 Key to figures

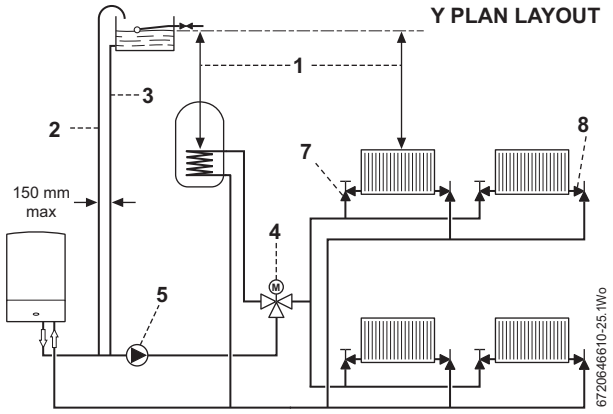
NOTICE: A drain cock should be fitted at the lowest point of the heating circuit and beneath the appliance.

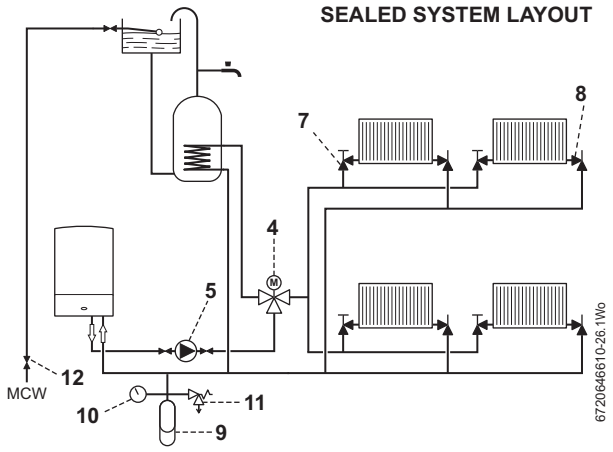
FULLY PUMPED SEALED SYSTEM:

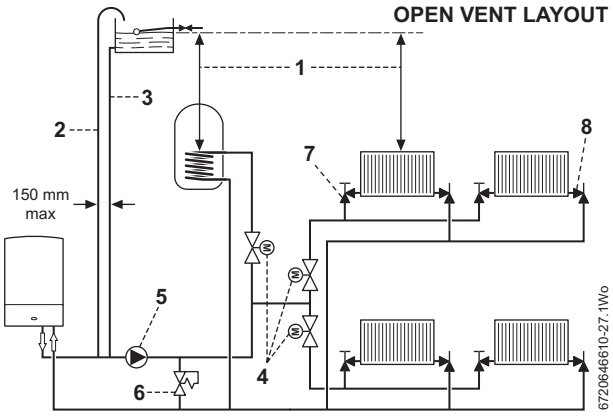
The central heating sealed system must be filled using a WRAS approved filling loop or comply with figure 3 for System fill.

EXISTING INSTALLATIONS

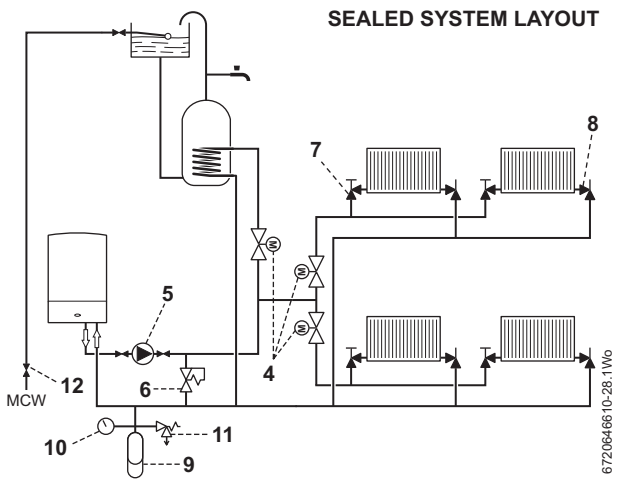








NEW INSTALLATION



3.4 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
*	Condensate trap of 75mm already incorporated into the boiler

3.4.1 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.

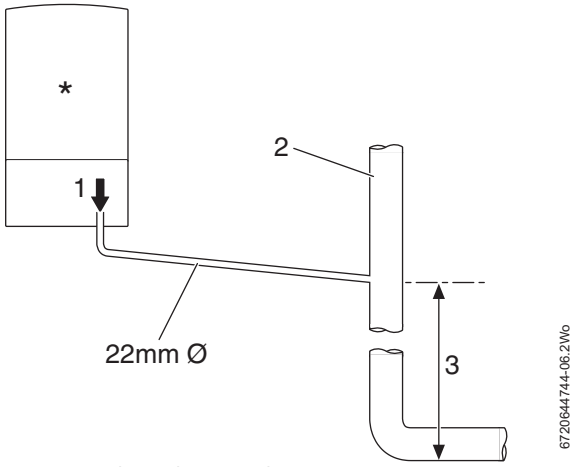


Fig. 4 Disposal to soil vent stack

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.

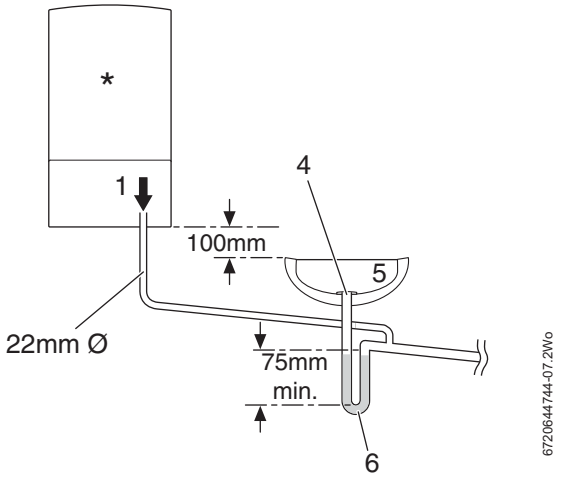


Fig. 5 Disposal to a waste pipe

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.

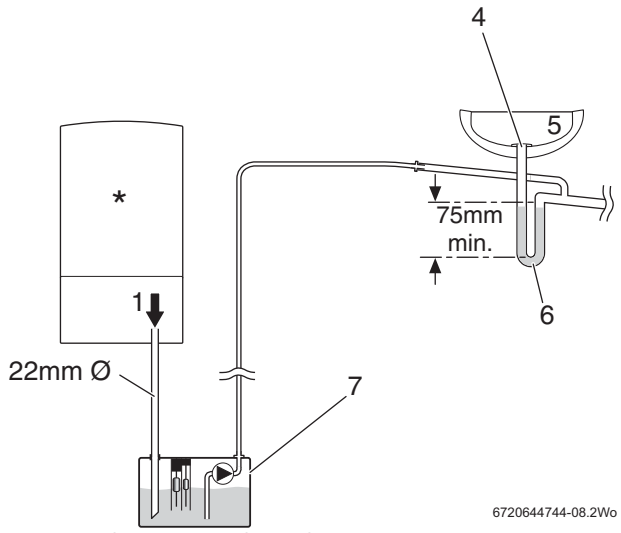


Fig. 6 Condensate pump disposal

3.4.2 EXTERNAL CONNECTIONS

NOTICE: Freezing conditions
- ▶ When the position of the boiler prevents internal routing, we recommend installing a CondenseSure siphon to significantly reduce the risk of freezing.
- ▶ Pipe work length should be kept to a minimum and the route as vertical as possible.
- ▶ Weather proof insulation must be used, if not using a CondenseSure siphon.

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

Continued - Key to condensate illustrations	
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

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:
- ▶ Use a CondenseSure siphon to help prevent the condensate freezing.
- ▶ The external run be kept as short as possible and not exceed 3 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, if not using a CondenseSure siphon.
- ▶ 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 stand.
- ▶ 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 7 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.

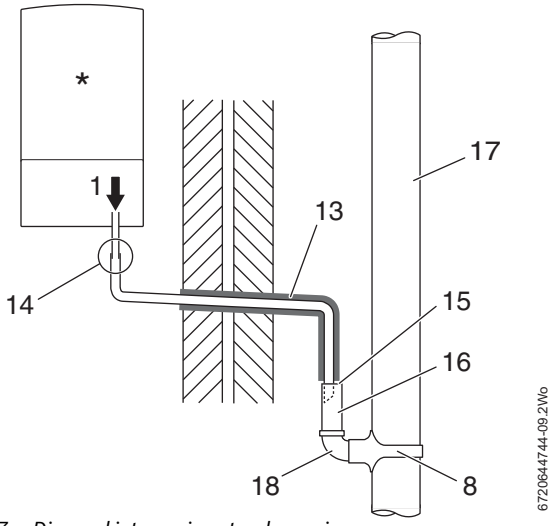


Fig. 7 Disposal into a rainwater down pipe

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.

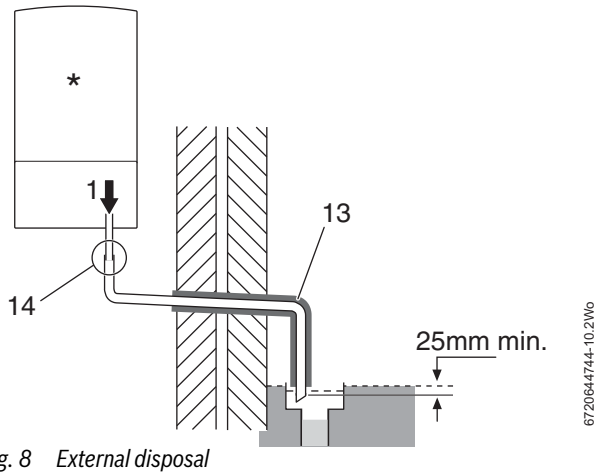


Fig. 8 External disposal

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 300mmØ .

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 and consideration should be given to using a CondenseSure siphon.

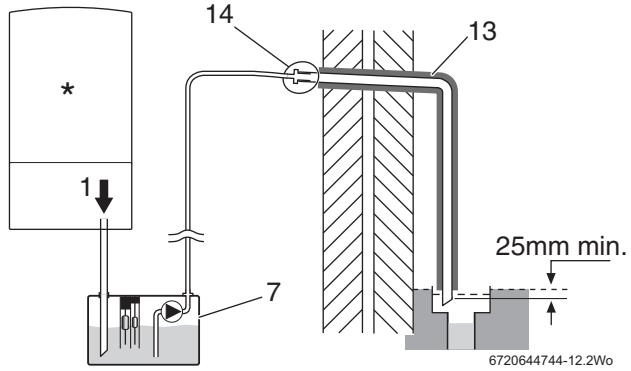


Fig. 9 Condensate pump to external disposal

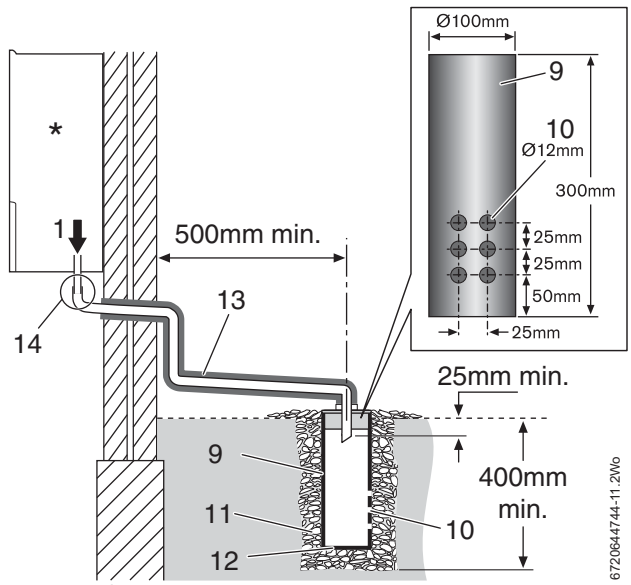


Fig. 10 Soak away

3.5 BOILER LOCATION AND CLEARANCES

3.5.1 INSTALLATION

This boiler is only suitable for installing internally within a property at a suitable location onto a fixed, rigid surface at least the same size as the boiler and capable of supporting the boiler weight.

NOTICE:
No surface protection is required against heat transfer from the boiler

3.5.2 INSTALLATION AND SERVICING CLEARANCES

Figure 11 shows the minimum space required to install and service the boiler in a compartment.

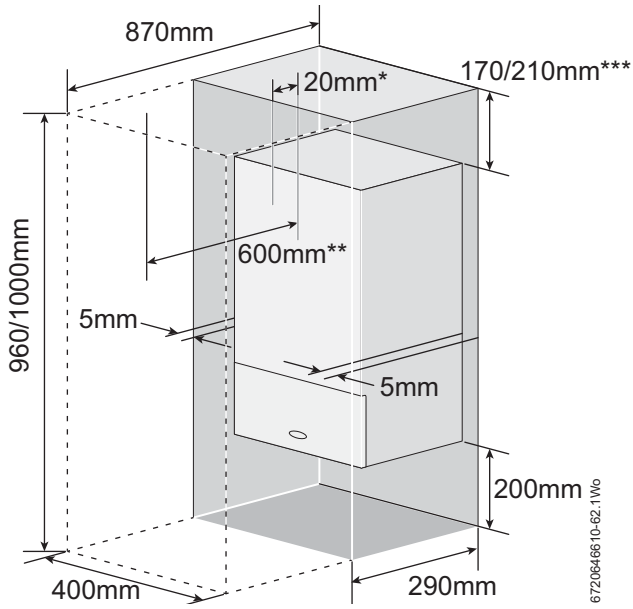


Fig. 11 Unventilated compartment

[*] Minimum clearance to removable door
[**] Minimum clearance required for servicing
[***] Height for either 60/100 flue or 80/125 flue

3.5.3 COMPARTMENTS:

Follow the requirements of BS6798 and BS5440 Part 2 and note:
- Minimum clearances must be maintained.
- An access door is required to install, service and maintain the boiler and any ancillary equipment.
- If fitting the boiler into an airing cupboard use a non-combustible material to separate the boiler from the airing space.
  The material can be perforated up to a maximum hole size of 13mm.

3.5.4 BATHROOMS

The appliance may be installed outside the shaded area, and in zone 2. Additional RCD (Residual Current Device) protection may be required. Refer to the latest IEE wiring regulations.

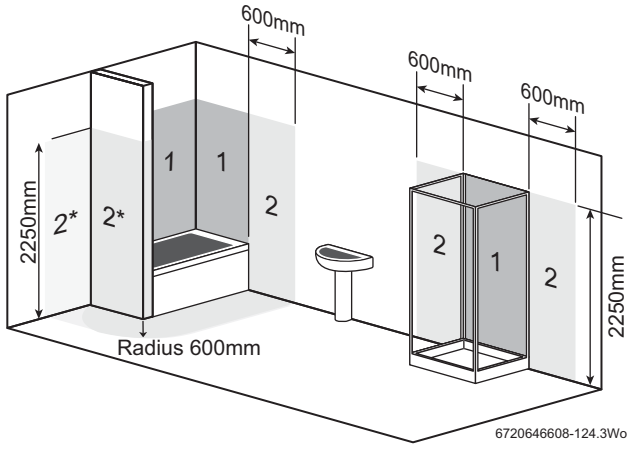


Fig. 12 Bathroom installations

3.6 PLUMBING MANIFOLD

3.6.1 CONNECTIONS

Heating System	22mm compression fittings
Gas	22mm compression fitting

Use the fittings supplied in the Hardware literature pack.

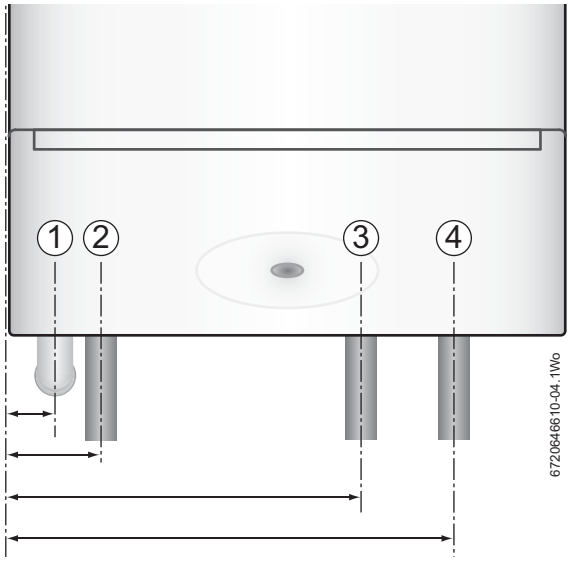


Fig. 13 Pipe dimensions

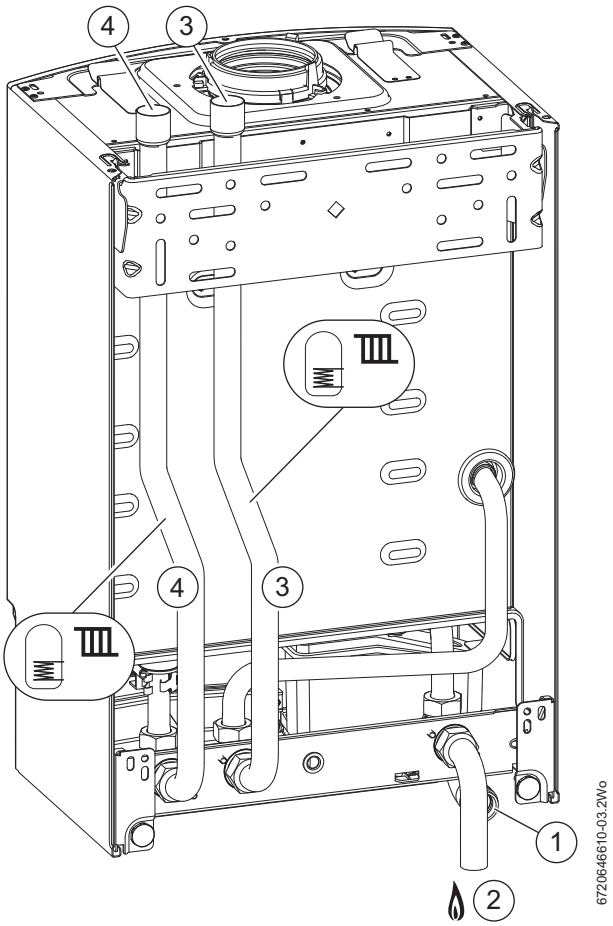


Fig. 14 Plumbing manifold

Key to figures 13 & 14:

[1] Condensate 22mmØ - Distance to left edge of case = 33mm
[2] Gas 22mmØ - Distance to left edge of case = 65mm
[3] Primary flow 22mmØ - Distance to left edge of case = 247mm
[4] Primary return 22mmØ - Distance to left edge of case = 312mm

3.7 FLUE OPTIONS

WARNING: Flue systems
- Only use Worcester, Bosch approved flue systems, no other manufacturer's flue systems have been approved for use with Worcester appliances.

CAUTION: Non accessible flue systems:
- 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.

NOTICE: Effective flue lengths:
- each 90° bend is equivalent to 2 metres of straight flue
- each 45° bend is equivalent to 1 metre of straight flue

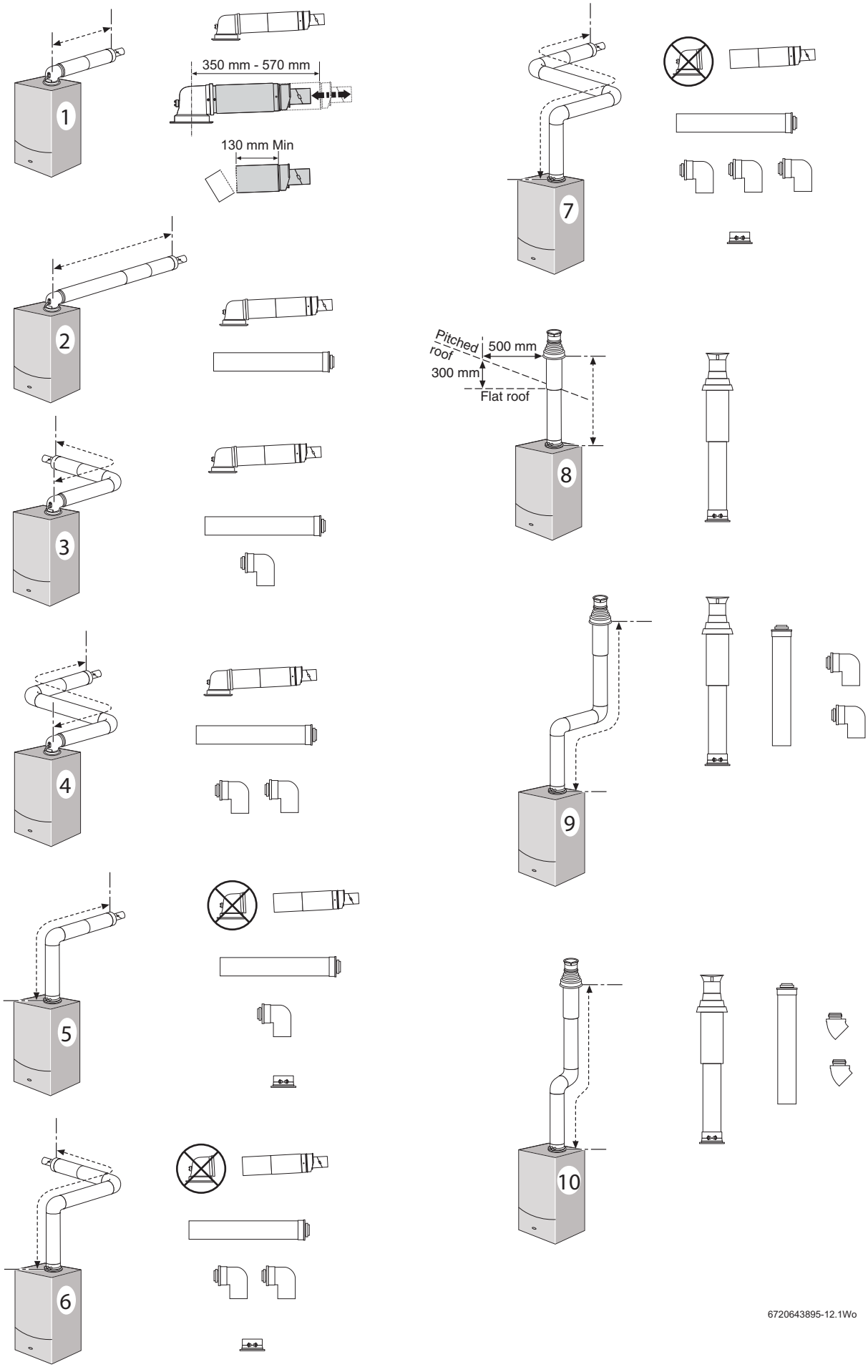
Ri Compact boilers		Maximum total flue length L (mm)	
FLUE TYPE		60/100	80/125
1	Telescopic horizontal flue assembly	130 - 570	405 - 600
	Longer telescopic horizontal flue assy.	570- 790	NA
2	Horizontal flue extension	6,000	15,000
3	Horizontal flue with 1 x 90° bend	4,000	13,000
4	Horizontal flue with 2 x 90° bends	2,000	11,000
5	High level horizontal flue	6,000	15,000
6	High level horizontal flue with 2 x 90° bends	4,000	13,000
7	High level horizontal flue with 3 x 90° bends	2,000	11,000
8	Vertical balanced flue assembly	6,000	15,000
9	Vertical balanced flue with 2 x 90° bends	2,000	11,000
10	Vertical balanced flue with 2 x 45° bends	4,000	13,000

Table 7 Flue options

Plume management kits are available for the 60/100 horizontal flue system.
Refer to the manual supplied with the Plume Management kits for complete installation instructions

The flue systems have different maximum flue lengths:
The Greenstar series has the option of two horizontal 60/100 RSF (telescopic and longer telescopic) and one horizontal 80/125 RSF (telescopic) flue system and two vertical RSF (60/100 or 80/125) flue systems:
The next page shows various fluing options.
Refer to the Flue options in table 7 for the straight flue lengths required to achieve the maximum flue length.

Part number	Flue	Description
7 716 191 082	60/100	Telescopic horizontal flue assembly
7 716 191 171	60/100	Longer telescopic horizontal flue assembly
7 719 003 702	80/125	Telescopic horizontal flue assembly
7 719 002 430	60/100	Vertical flue assembly
7 719 002 431	80/125	Vertical flue assembly


1
350 mm - 570 mm
130 mm Min
2
3
4
5
6
7
Pitched roof
500 mm
300 mm
Flat roof
8
9
10
6720643895-12.1Wo

3.8 FLUE TERMINAL POSITIONS

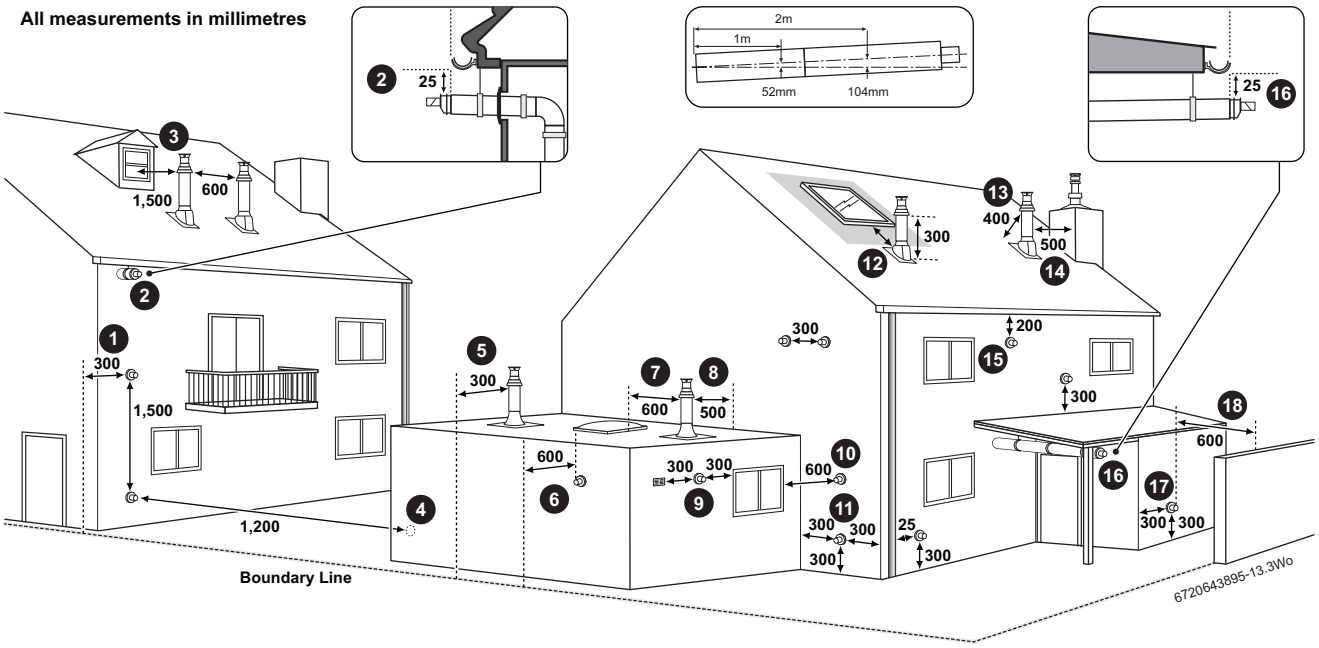


Fig. 15 Flue terminal positions

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 (flue bracket 100mm part number: 7 716 191 177, flue brackets 100mm x 6 part number:7 716 191 178, flue bracket 125mm part number: 7 716 191 179).

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.
4. 1,200mm between terminals facing each other.
5. Vertical flue clearance, 300mm adjacent 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.
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.

3.9 PLUME MANAGEMENT TERMINAL POSITIONS

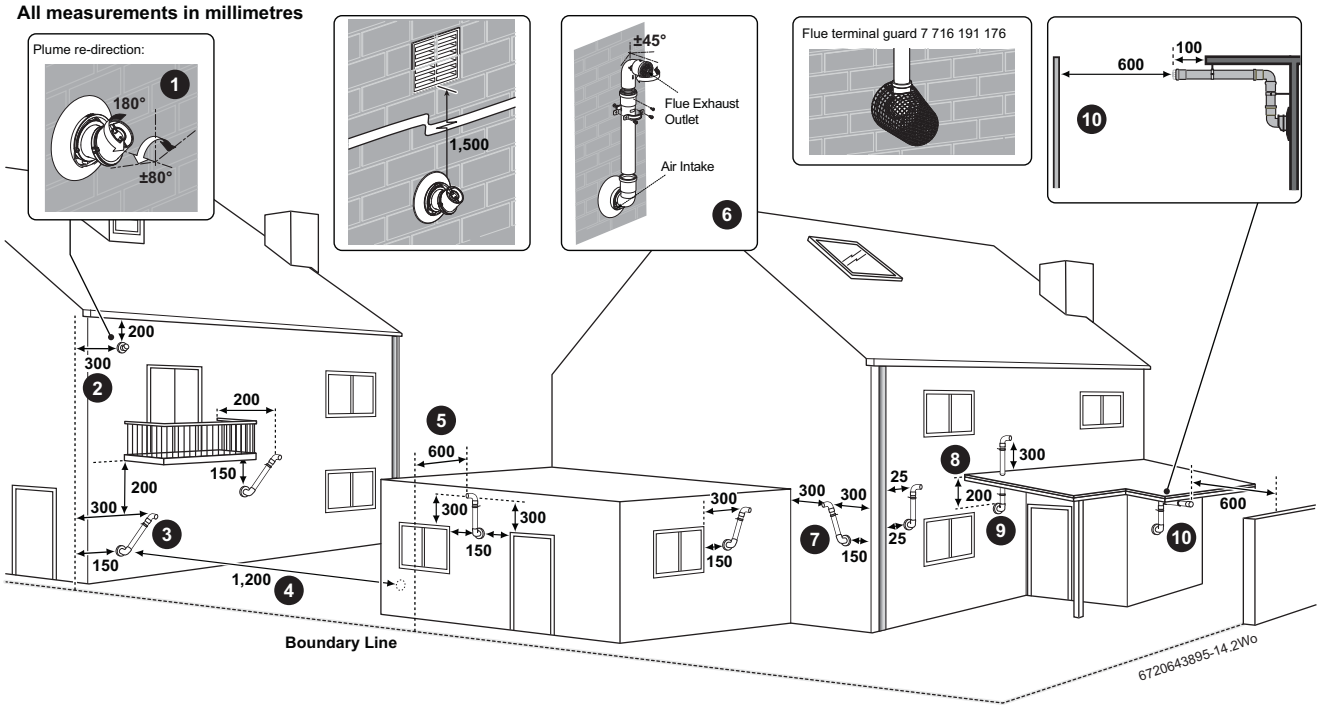


Fig. 16 Plume terminal positions

NOTICE:

- ▶ All measurements are the minimum clearances required.
- ▶ The minimum length plume management length is 500mm to a maximum of 4,500mm, this includes two 90° bends. Maximum flue length is reduced from 6,000mm to 5,000mm when plume management of 500mm is used. Maximum flue length of 2,200mm with maximum plume management of 4,500mm
- ▶ For each metre (1000mm) of plume management length the internal flue length is reduced by 700mm.
- ▶ Subsequent 45° bends = 750mm reduction and 90° = 1500mm reduction in plume length.
- ▶ Refer to previous page for all concentric flue terminal positions unless the flue position is specified on the figure above “Plume terminal positions”.
- ▶ 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.

Key to illustration

1. This feature allows some basic plume re-direction options on a standard telescopic horizontal flue terminal. 300mm minimum clearances to a opening e.g. window. However the minimum clearances to an opening in direction that the plume management is facing, must be increased to 1,500mm. Where the flue is less than 150mm to a drainpipe and plume re-direction is used the deflector should not be directed towards the drainpipe.
2. 300mm adjacent to a boundary line.
3. Plume Management Kit air intake can be reduced to 150mm providing the flue exhaust outlet is no less than 300mm adjacent to a boundary line.
4. 1,200mm between terminals facing each other.
5. 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.
6. Using a Plume Management Kit the air intake measurement can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance. Plume kits running horizontally must have a 10° fall back to the boiler for proper disposal of condensate. For details on specific lengths see relevant boiler Technical & Specification information.
7. Internal/external corners. The air intake clearance can be reduced to 150mm providing the flue exhaust outlet has a 300mm clearance.
8. Clearances no less than 200mm from the lowest point of the balcony or overhang.
9. 1,200mm from an opening in a car port on the same wall e.g. door or window leading into the dwelling.
10. 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.

3.9.1 DETERMINE THE PLUME MANAGEMENT SYSTEM LENGTH

Effective straight flue length with plume management	
Minimum plume length (M) 500mm	**Maximum plume length (M) 4,500mm**
Max flue length (L) 5,000mm	Max flue length (L) 2,200mm

Note: Measurement "M" plume length

- "M" must be a minimum of 500mm and must not exceed 4,500mm for a 60mm plume management system used with the horizontal Ø 60/100mm flue.

MINIMUM PLUME MANAGEMENT LENGTH

The minimum plume length is 500mm to ensure that the air inlet and exhaust have a minimum distance of 500mm between them.
The plume management can be in any configuration, within the parameters of the plume management installation instructions, as long as it does not terminate inside the shaded area.

WARNING: Minimum plume management length.
The minimum distance of 500mm must be maintained between air inlet and exhaust.

- Do not terminate the plume management inside the shaded area shown in figure 17

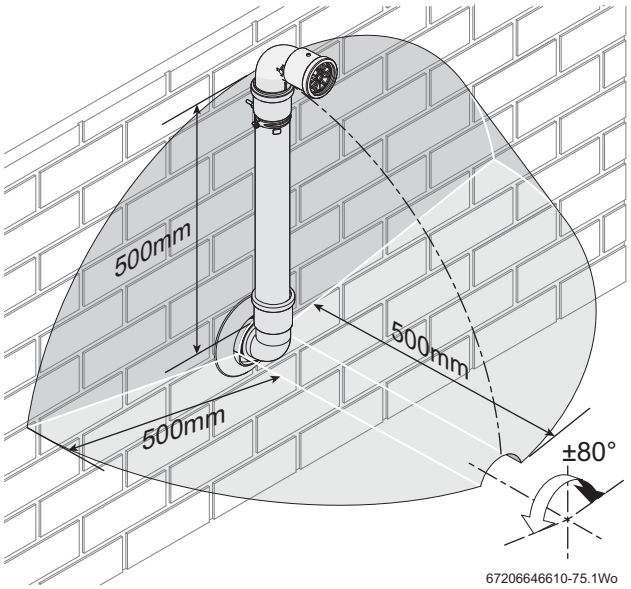


Fig. 17 Terminal exclusion zone

NOTICE: Cutting the 500mm pipe
If the 500mm plume management pipe kit is cut, an additional elbow will be required to join the pipework.

- The Plume management extension kit contains the components required for such a configuration.

FLUE LENGTH VERSUS PLUME MANAGEMENT LENGTH

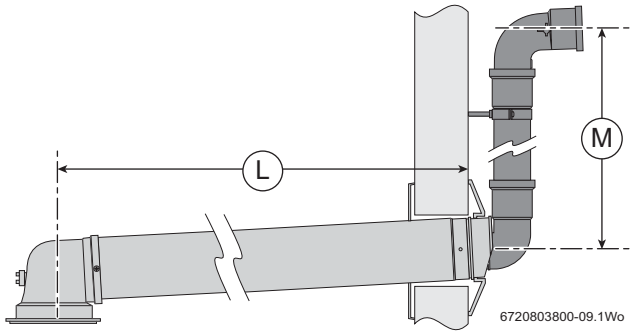


Fig. 18 Effective lengths L and M

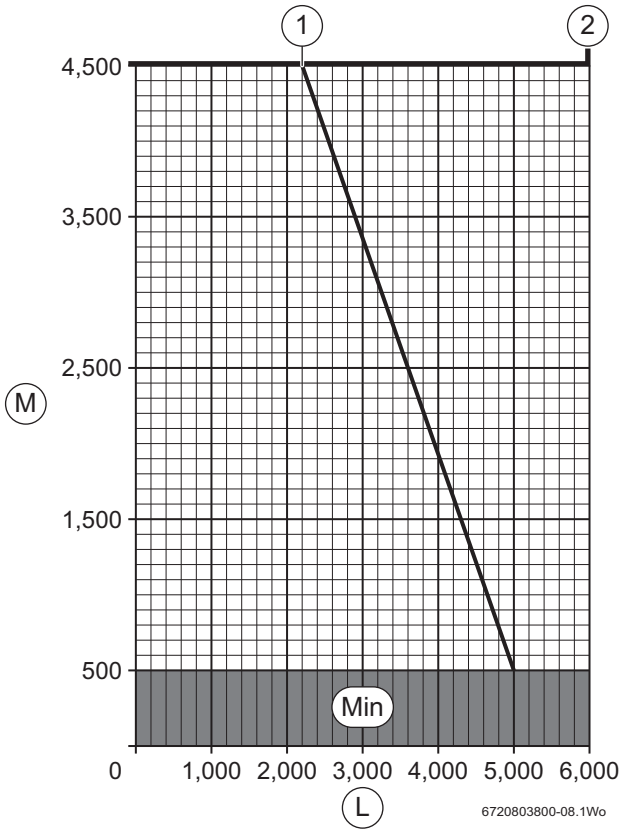


Fig. 19 Effective flue lengths versus plume management lengths

[Min] Minimum plume kit length 500mm
[M] Plume management length allowed (mm)
[L] Effective flue length (mm)
[1] 27 & 30 i System Compact data line
[2] Maximum plume length for all boilers

Refer to figure 19 to determine the appropriate plume length (M) versus the flue length (L).
The lengths for both plume and flue are the effective lengths, which includes the effective length of any bends plus the straight lengths.
The graph can be used to calculate:

- **Effective flue length** if a specific effective plume length is required.
- **Effective plume length** if a specific effective flue length is required.

4 INSTALLATION

WARNING: All the previous "Pre-Installation" sections must be read and the requirements met before starting boiler or flue installation.

4.1 UNPACKING THE WALL FRAME & ANCILLARY ITEMS

CAUTION: LIFTING AND CARRYING
- ▶ Only lift a manageable weight, or ask for help.
- ▶ Bend the knee and keep the back straight with feet apart, when lifting or putting down heavy objects.
- ▶ DO NOT lift and twist at the same time.
- ▶ Lift and carry object close to the body.

1. Open the top of the carton and remove the water pipes (1) and the wall mounting frame (2).
2. Remove all the other items to enable the boiler to be unpacked.

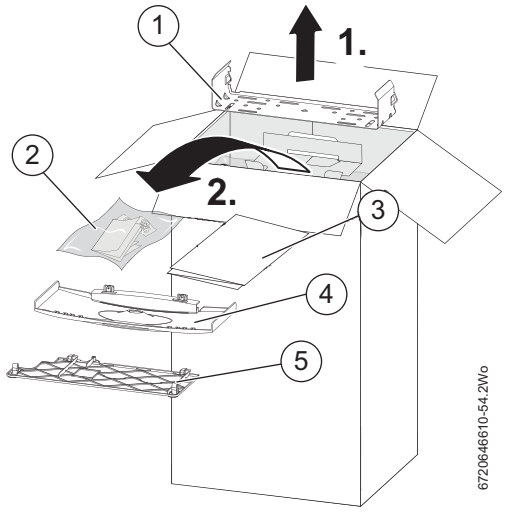


Fig. 20 Unpacking

[1] Wall mounting plate
[2] Installer pack
[3] Literature pack
[4] Front fascia flap
[5] Bottom panel

IMPORTANT HANDLING INSTRUCTIONS:

- It is advised that two people are used to carry the carton from the van to the point of delivery.
- Once the carton has been delivered, remove the outer carton. Care should be taken when releasing the straps. If a sharp implement is used, make sure the outer carton is not pierced and that the implement is used in such a way so that it will not cause personal injury.
- All sharp objects must be covered or the blade retracted after use and put away in a safe place. The wall mounting frame, Installer pack, template and bottom panel can now be removed. Care should be taken when lifting the boiler from the base and the proper technique for safe lifting of any heavy object must be strictly observed.

Additional requirements for roof space installation:

- The boiler must be unpacked before ascending ladder to loft space.
- Two sets of steps should be used.
- Two people should share the lifting of the boiler up to the loft hatch, insert the boiler into the loft space tilted and slid in on its back.
- Once the appliance is removed from its packaging check the contents against the packing list.

Before installing the appliance, ensure that the system has been cleaned as explained on page 9.

4.2 WALL MOUNTING TEMPLATE & FLUE OPENING

WARNING: BEFORE DRILLING, ENSURE THAT THERE ARE NO PIPES, ELECTRICAL CABLES, DAMP PROOF COURSES OR OTHER HAZARDS.

SAFETY:

All relevant safety precautions must be undertaken. Protective clothing, footwear, gloves and safety goggles must be worn as appropriate.

FIXING THE MOUNTING PLATE:

- ▶ The boiler template shows the relative positions of the flue and the top and bottom fixing of the mounting frame.

1. Fix the template to the wall in the desired position.
2. Drill four holes for the wall mounting plate through the template, utilising shaded mounting holes.
   Drill two holes for the bottom fixing screws.
   Additional holes may be used if required.

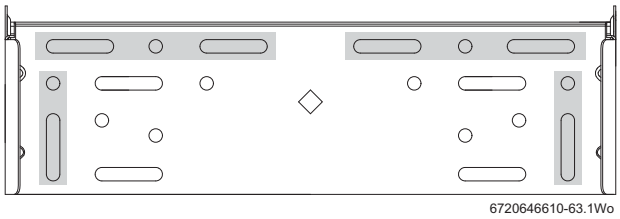


Fig. 21 Mounting holes

The template has been sized to allow for minimum clearances of 5mm sides, 200mm base and 30mm above a 100mm diameter flue elbow.

REAR FLUE OUTLET

- ▶ The drawing opposite shows the boiler template with the flue centre lines of both the 100mm and 125mm flue systems.

3. Mark centre line of flue to be used (3); the external diameter of the hole can also be marked if required.

- ▶ If a 100mm diameter flue is to be used, a 125mm diameter hole is required. However, if using the weather sealing collar by pushing it through from inside the property, then a 150mm diameter hole is required to accommodate this.
- ▶ The flue turret of the 100mm flue has an in-built 3° angle.
- ▶ If extensions are to be added then the complete flue must rise at an angle of 3°.
- ▶ The 125mm diameter flue system will require the flue to rise at an angle of 3°.
- ▶ Drill the hole, preferably using a core drill.

SIDE OUTLET:

4. Mark from the centre line of the wall template to the wall which the flue will pass through (4).

- ▶ Allow for a rise of 52mm per metre length of flue, to give a 3° angle.
- ▶ Clear any debris from the site.

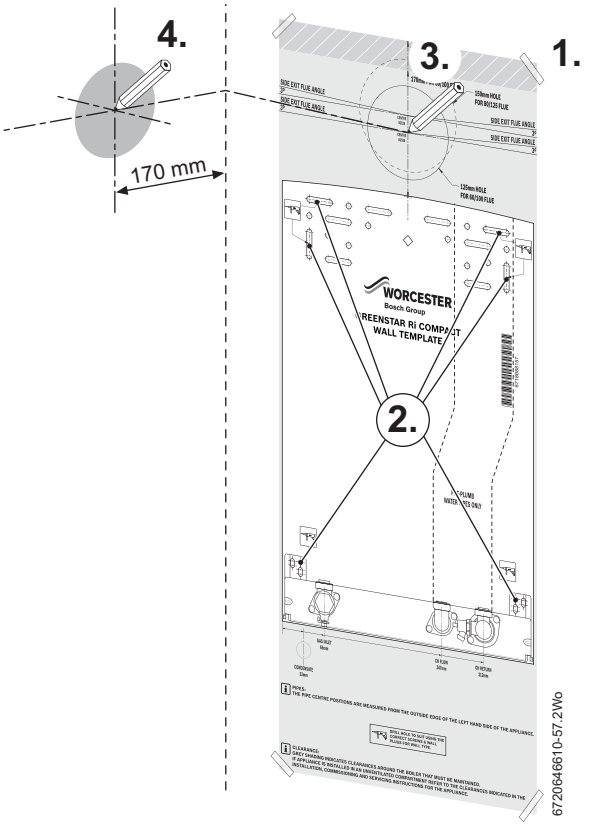


Fig. 22 Marking the flue position

4.3 UNPACKING THE APPLIANCE

1. Remove outer carton (1) and place safely away from the working area.
2. With the outer packaging removed and the inner sleeve (2) can be removed.
3. Remove the protective wrapping (4) from the boiler.
4. Lie the boiler on the floor and discard the packing base (3).

CAUTION: Hanging the boiler
- ▶ Remove the plastic bungs fitted to pipes before hanging the boiler.

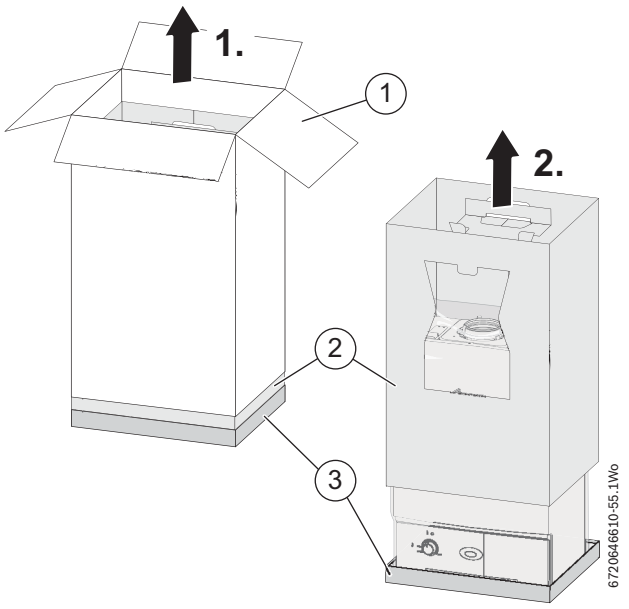


Fig. 23 Remove outer carton

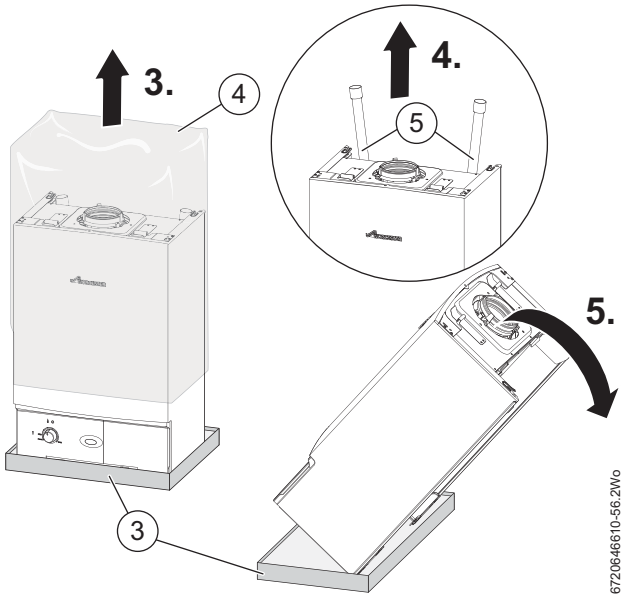


Fig. 24 Remove packaging

1. Outer carton
2. Inner sleeve
3. Packing base
4. Protective wrapping
5. Primary flow and return water pipes

REMOVING THE OUTER CASE

- ▶ Before the case can be remove the control panel must be moved into the service position, i.e. swivelled down.

1. Unscrew the retained catches securing the fascia.
2. Pull the catches towards you to release the panel.
3. Pull the fascia towards you slightly and then lift and pull forward to swivel down into the service position.
4. Ensure that the control panel is in the service position i.e. swivelled down.
5. Release the two screws securing the lower part of the case.
6. Release the spring clips at the top of the boiler.
7. Slide the case off the frame and place safely away from the working area.

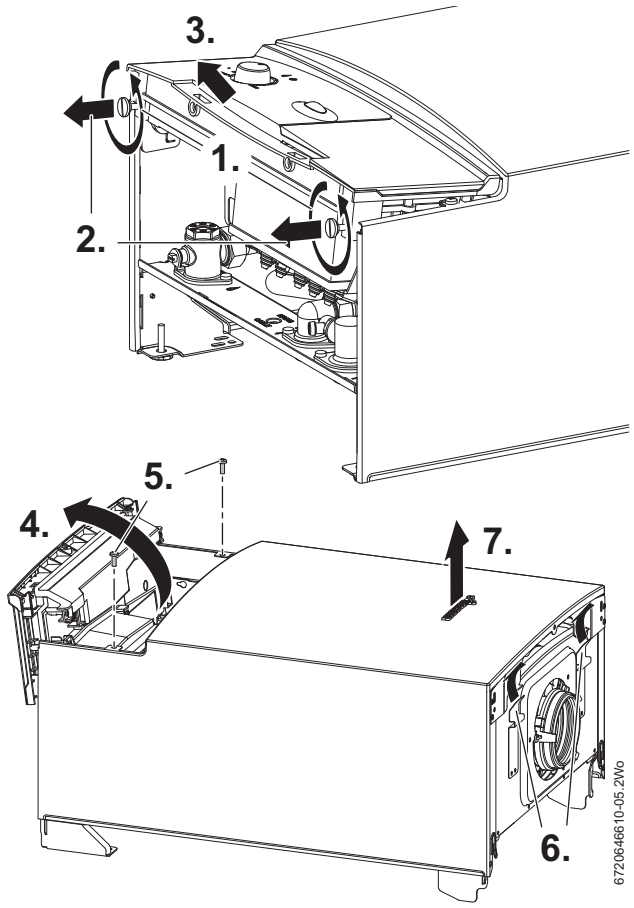


Fig. 25 Releasing the control panel

▶ Remove any packaging within the boiler and the packaging base (3).

4.4 BOILER CONNECTION

CAUTION: Mains supply
▶ Isolate the mains electrical supply before starting any work and observe all relevant safety precautions.

WARNING: Pipe caps
▶ Caps fitted to pipes must be removed before hanging the boiler

4.4.1 WALL MOUNTING PLATE

▶ Remove wall mounting template.
▶ Mount the wall plate to the wall utilising at least one mounting hole in each of the shaded areas.
Use fittings appropriate for the boiler weight and wall type.
▶ Other mounting holes may be utilised if required.

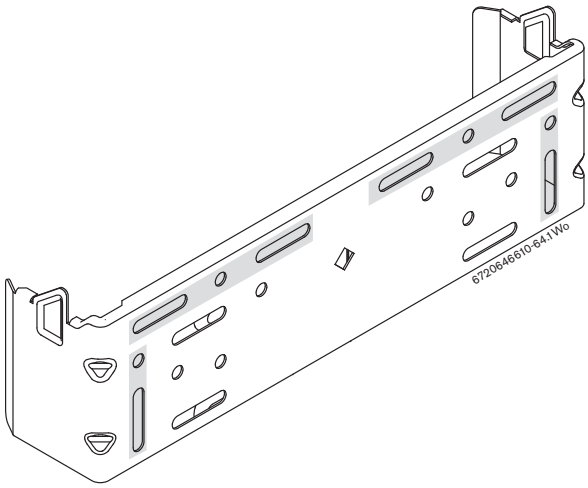


Fig. 26 Wall mounting plate

4.4.2 GAS AND WATER CONNECTIONS

▶ The flow and return pipes can be fitted to the boiler before hanging the boiler on the wall plate.
▶ If there is greater than 600mm clearance below the appliance it is possible to fit the flow and return pipes, supplied, with the boiler installed on the wall.

1. Condensate (22mmØ)
2. Gas inlet (22mmØ)
3. Flow (22mmØ which is flared to 28mmØ at one end and can be removed if required)
4. Return (22mmØ which is flared to 28mmØ at one end and can be removed if required)

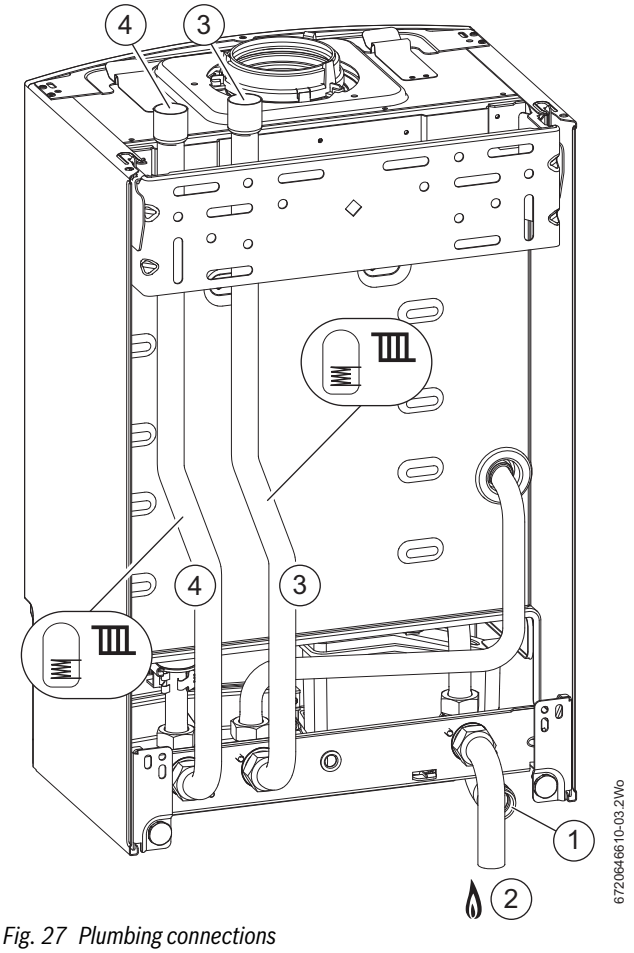


Fig. 27 Plumbing connections

4.4.3 HANGING THE BOILER

NOTICE: Before hanging the boiler.
- ▶ If pipes require reducing in length this is best done before they are fitted to the boiler.

NOTICE: Lifting the boiler.
- ▶ Lift the boiler using the handling holes at either side of the frame.
  Do not lift the boiler by the air gas manifold or control box.

System pipes may be run vertically up behind the boiler or below it.
The boiler mounting points on the wall frame are indicated in figure 28.
Ensure the wall frame sides are not slightly splayed out after mounting; move the sides in to allow the boiler to slide on to frame.

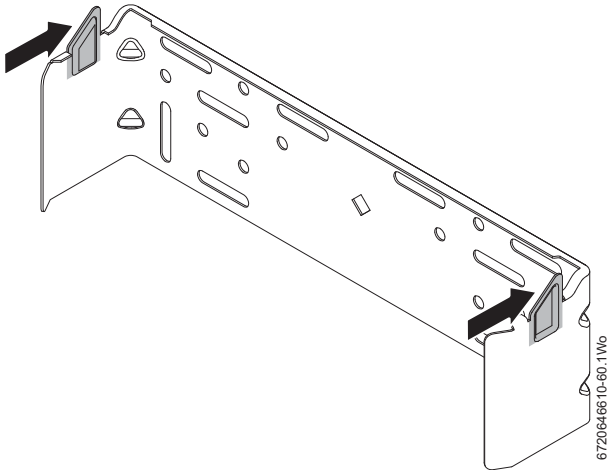


Fig. 28 Wall frame boiler mounting points

- ▶ Lift the boiler onto the wall plate.
- ▶ Ensure that the boiler is presented slightly higher than the wall frame so that the slots in the boiler frame slide over the mounting points on the wall frame.
- ▶ Lower the boiler onto the wall frame mounting point, ensure that the wall frame mounting points are fully engaged with the slots in the boiler frame.

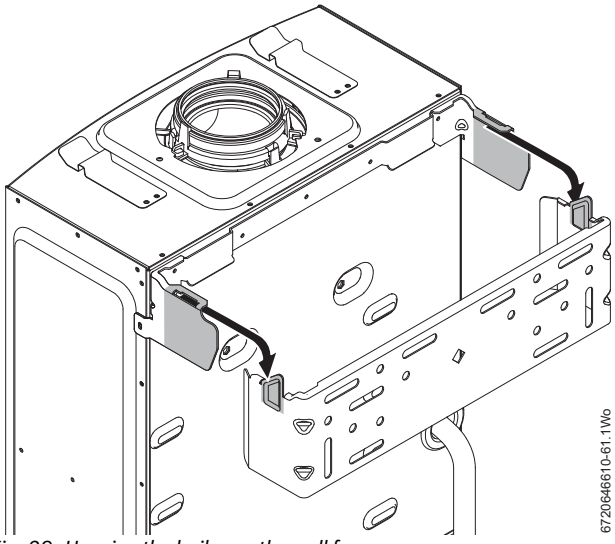


Fig. 29 Hanging the boiler on the wall frame

- ▶ Level vertically using the feet (1) at the bottom rear of the boiler casing.
- ▶ Fit retaining screws through the holes (2) in the boiler frame to secure the boiler.
- ▶ Make connections to the heating system pipes.

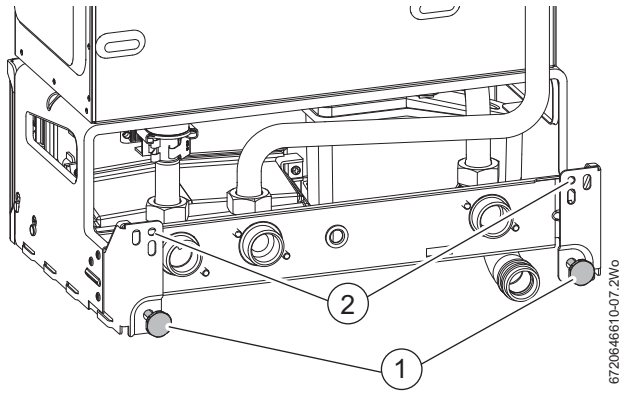


Fig. 30 Levelling and securing detail

4.4.4 CONDENSATE CONNECTION

Never terminate or discharge into any open source, including; sink, bath, shower, bidet, toilet etc.

NOTICE: Condensate disposal
- ▶ Follow the recommendations given in section 3.4 “Condensate pipe work” for all condensate disposal installation.
- ▶ Ensure that the condensate pipe work falls at least 50mm per metre towards the outlet.
- ▶ * Do not use solvents, adhesive or lubricant when pushing the pipe onto the rubber connector.

Figure 32 gives the pipe work dimensions with respect to the mounting surface.
- ▶ Fit the condensate discharge pipe as far back as possible to the wall to ensure easy fitting of the boiler bottom panel.
- ▶ Route the condensate pipe to an appropriate discharge point, refer to section 3.4.
- ▶ Plumb up to the wall frame with 22mm pipe.
- ▶ Ensure that there is enough pipe to insert 25mm into the rubber hose connector. Attach the discharge hose from the siphon to the condensate drain pipe.

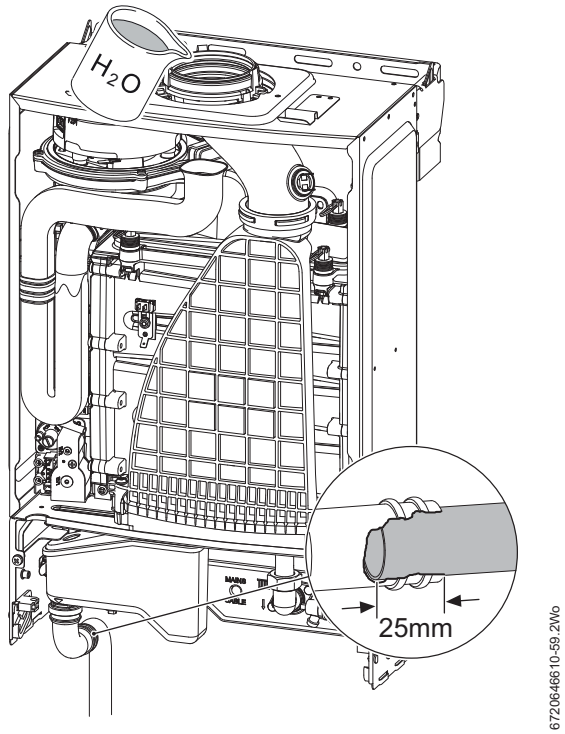


Fig. 31 Connecting and filling the siphon

▶ When the condensate connections are complete, pour approximately 200 to 250ml of clean water through the inner flue opening on top of the boiler to fill the siphon.

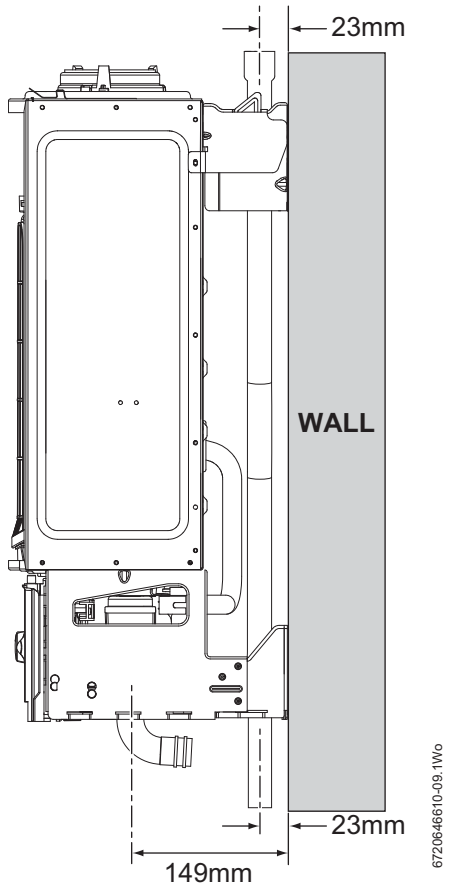


Fig. 32 Pipe work dimensions

4.5 FLUE INSTALLATION

HORIZONTAL FLUE (60/100mm diameter)

For vertical flues and 80/125mm horizontal flues, please refer to separate instructions supplied with the flue kit.

To ease assembly of flue components, apply silicone lubricant to sealing surfaces.

Basic instructions for the 60/100mm diameter flue are shown below.

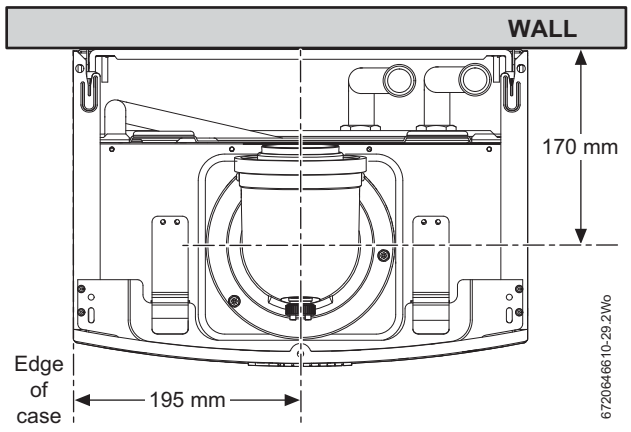


Fig. 33 Flue turret centre

4.5.1 MEASURING THE FLUE (STANDARD FLUE):

▶ Measure from the outside of the wall to the centre line of the flue turret to determine length L.
▶ Subtract 50mm from the length L to give the correct dimension to the flue elbow connection.
▶ If the length L falls within the telescopic range of 350 to 570mm or 570 to 790mm using the longer telescopic flue, then no cutting will be required.
▶ If the required length is less than 350mm the standard telescopic flue can be modified, refer to fig. 35.
▶ If the required length is greater than 570mm, then the longer telescopic flue, giving a range of 570 - 790mm, can be used
▶ If the required length is greater than 790mm, then flue extensions will have to be used. Refer to the 60/100 Horizontal Flue Instruction manual provided in the telescopic flue kit.
▶ Refer to section 3.7 for flue options.

Adjusting the telescopic flue length:

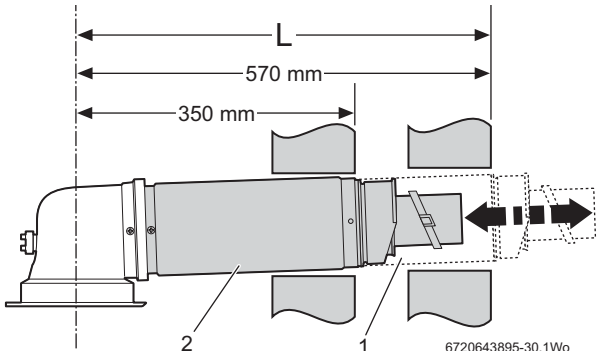


Fig. 34 Standard telescopic flue

Extend tube (1) by withdrawing from tube (2) to achieve the flue length required, between 350 - 570mm or 570 to 790mm if using the longer telescopic flue.

Secure with screw provided and seal joint with the aluminium tape supplied.

4.5.2 REDUCING THE TELESCOPIC FLUE LENGTH

Ensure that the “TOP” label is facing up before securing the flue section to the turret.

The flue terminal MUST be fitted with the 'TOP' label uppermost to allow the correct fit and use of the plume management system.

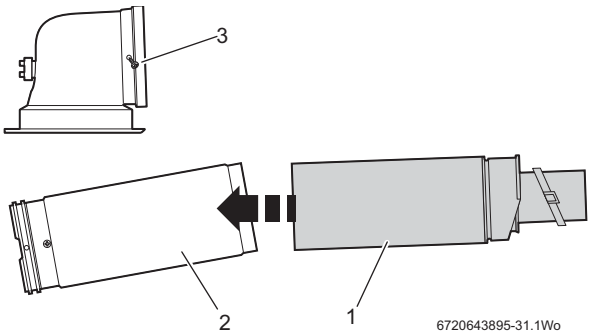


Fig. 35 Reducing the standard terminal

▶ Remove securing screws (3) to detach the terminal assembly from the turret.
▶ Slide terminal section (2) from the terminal assembly and discard.
▶ To use terminal (1) without cutting remove the location lug (4) on the inner flue tube (5) and remove any burrs.
▶ Push the terminal fully home into the turret and secure the terminal end with the screws (3).

To reduce the flue length further:

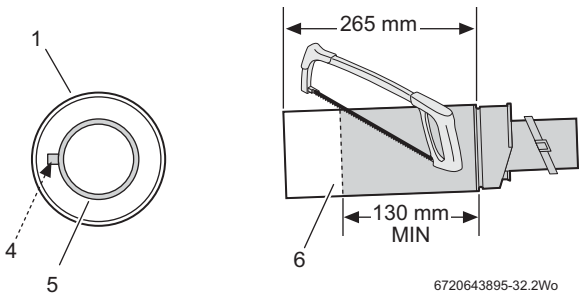


Fig. 36 Further reduction

- ▶ Mark the length required for the terminal as shown (min.130mm) and cut square, taking care not to damage the tubes.
- ▶ Remove any burrs and chamfer the edges of the tubes to assist ease of connection and prevent seal damage.
- ▶ Push the terminal fully home into the turret and secure the terminal end with the screws (3), ensure that the "TOP" label is facing up.

The aluminium tape is not required when reducing the terminal.

4.5.3 INSTALLING THE TELESCOPIC FLUE:

Refer to figure 37.

1. Set the flue length to the distance required, secure with screws provided.
2. Seal the joint with the aluminium tape provided.
3. Slide the inner wall seal onto the terminal.
4. If fitting from inside the building; slide the outer wall seal onto the terminal.

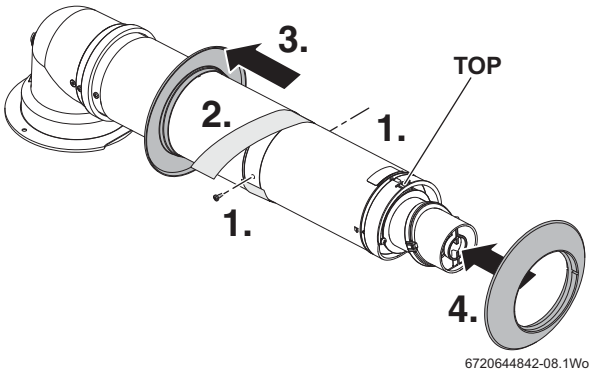


Fig. 37 Telescopic flue

The turret securing screws are from the boiler and are not in flue kit.

Refer to figures 38 & 39.

1. Remove the three inner flue tube retaining screws (2).
   The inner tube will be held in place in the appliance.
2. Check the boiler flue seal is correctly seated and apply silicone grease.
3. Position terminal through the flue opening in the wall to the outside of the building by the distance shown.
   - or -
   If the outer seal is already fitted, push the terminal through the hole until the outer seal is outside and then pull the terminal back to the wall to seal.
4. Align the flue turret to the boiler flue outlet with flat facing (1) to the rear of the boiler.
   The flue turret should be pushed straight down, on to the boiler.

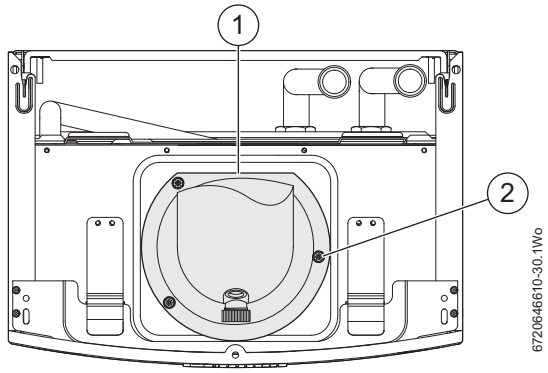


Fig. 38 Aligning the turret

- ▶ Fit the screws removed in step 1 to secure flue turret.
- ▶ If fitting the outer seal from outside the building, slide the outer wall seal onto the terminal as shown.
- ▶ "Make good" the gap between the flue and inner wall and if possible on the outer wall.

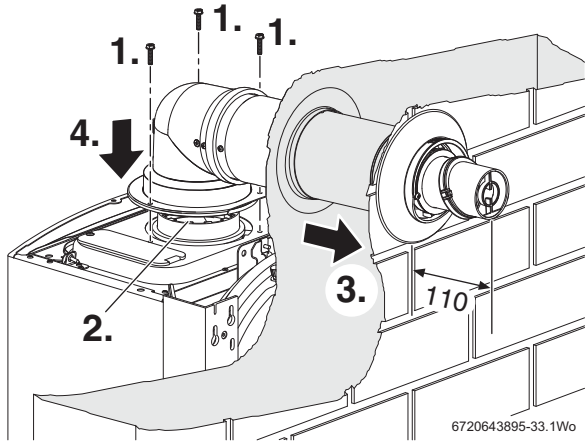


Fig. 39 Telescopic flue installation

For more information refer to the 60/100 Horizontal Flue kit Instruction Manual

ADDITIONAL NOTES AND REMINDERS:

- Ensure that all cut lengths are square and free from burrs.
- The flue is sealed when assembled correctly and the components are pushed fully home and secured by the screws provided.
- The flue is set at an angle of 3° or 52mm per metre length.

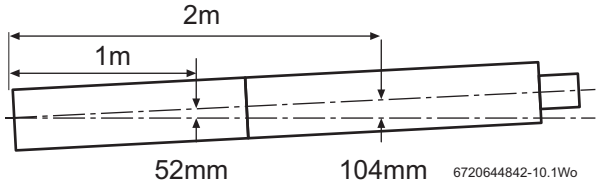


Fig. 40 Slope for condensate disposal

4.5.4 FLUE TERMINAL PLUME RE-DIRECTION:

The flue discharge can be re-directed allowing some plume redirection control, alternatively, a complete plume management system can be fitted to the flue terminal.

RE-DIRECTING THE FLUE DISCHARGE

1. Unclip (1 & 2) the terminal end and rotate through 180°.

NOTICE: DO NOT rotate the complete terminal assembly.

2. Refit to the terminal, ensuring that the clips (1 & 2) are engaged and secure.
3. Loosen screws (3) and rotate the entire outlet assembly to redirect the plume. Tighten screws (3) to secure in the required position.

The flue terminal outlet has built-in stops to limit rotation for horizontal flues to allow condensate to run back into the boiler for safe disposal. Do not attempt to force beyond the limit stops.

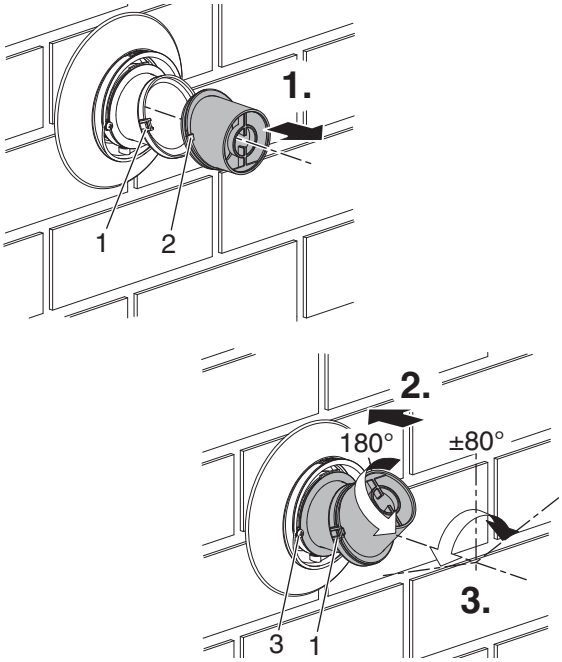


Fig. 41 Plume redirection

NOTICE: Outlet position
- The flue terminal outlet position must follow those stated in the relevant appliance instruction manual. When redirecting the flue discharge the outlet terminal must be at least 1500mm from any opening in the direction of the discharge to prevent combustion products from entering the building.

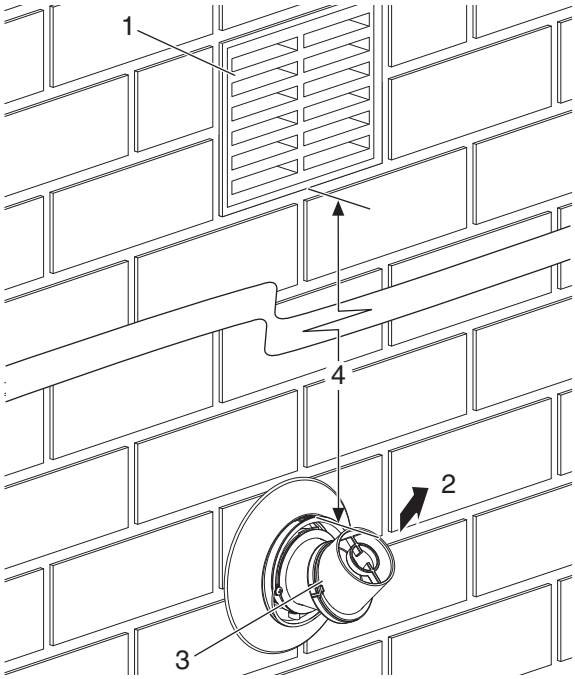


Fig. 42 Plume distance to opening

1	Opening in building
2	Flue discharge
3	Plume deflector
4	Minimum 1500mm from an opening in the building

Table 8 Key to figure 42

4.6 ELECTRICAL

CAUTION: Mains electrical supply
- Isolate the mains electrical supply before starting any work and observe all relevant safety precautions.

NOTICE: The boiler is fitted with a mains power cable.
- Should this not be required it can be removed and replaced with a cable suitable to the installation. The electrical connector from the PCB must be re-used. A replacement grommet is provided in the hardware/literature pack but must be cut to suit the cable diameter when fitting.

ELECTRICAL - STANDARD 230V WIRING CENTRE INSTALLATIONS

- The mains electrical supply to the boiler and system wiring centre must be common, and through either a fused double pole isolator or a fused three pin plug and unswitched socket.
- The isolator/socket, where practicable, should be situated next to the boiler.
- The isolator must have a minimum of 3mm contact separation in both poles.
- Any system connected to the boiler must not have a separate electrical supply.
- External fuse rating 3A.
- Route the 230 V mains power cable, from the control box, to the mains isolator next to the boiler.

ELECTRICAL - GREENSTAR WIRING CENTRE (OPTIONAL ACCESSORY)

The additional following information applies:
- The mains electrical supply to the boiler and system wiring centre should where practicable be common, and through either a fused double pole isolator or a fused three pin plug and unswitched socket.
- If separate isolators are used refer to the Greenstar Wiring Centre Installation Commissioning & Servicing Instructions for further information

ACCESS TO ELECTRICAL CONNECTIONS

1. Refer to fig. 43 and remove the screws in the installer access cover.
2. Lift the “Installer access cover”.
3. Remove the cover.

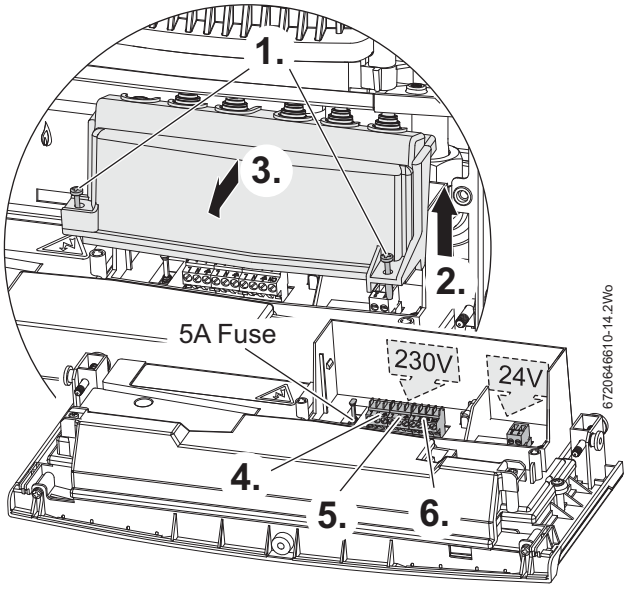


Fig. 43 Removing the installer access cover

4. Mains in connections
5. Pump connections
6. Mains out connections

CONNECTORS

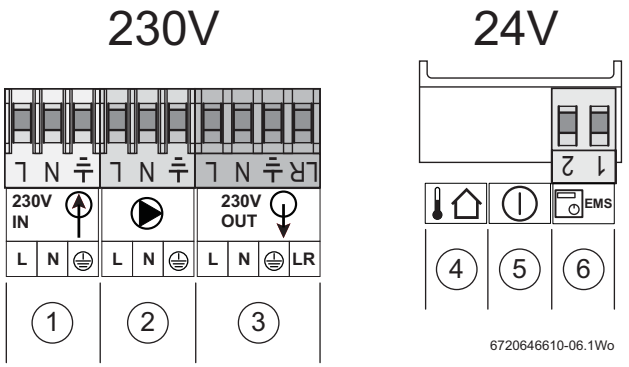


Fig. 44 230V and 24V connections

1	230V mains input
2	Pump connection
3	230V output to external controls
4	Outdoor compensation sensor (not used)
5	External cut off switch (not used)
6	EMS BUS connection

4.6.1 MOUNTING OPTIONAL PLUG-IN CONTROLS - ONLY WITH GREENSTAR WIRING CENTRE (OPTIONAL ACCESSORY

CAUTION: Mains electrical supply
▶ Isolate the mains electrical supply before starting any work and observe all relevant safety precautions.

NOTICE: Link required
▶ L and LR must be linked when using the Greenstar wiring centre

Refer the to Programmer/Timer manual for set up and operation of the unit.

REMOVING THE BLANKING PLATE

The control panel must be released and swung forward slightly to gain access to the top cover panel, refer to section 6.4 for access to the control panel.

1. Release the captive screws securing the top cover panel.
2. Remove the cover panel to enable the blanking plate [1] to be removed.
3. Press your thumbs on the bottom edge of the blanking plate to release the clips from the slots in the control panel and push up.
4. Pull the blanking plate forward to remove.

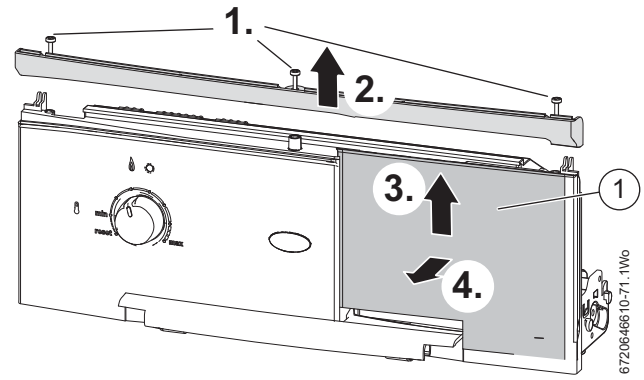


Fig. 45 Removing the blanking plate

FITTING THE PROGRAMMER/TIMER

5. Connect the ribbon cable connector [2] to the socket (3), ensuring that the cable will fit into the recess (4).
6. Align the clips on the back of the Programmer/Timer with the slots.

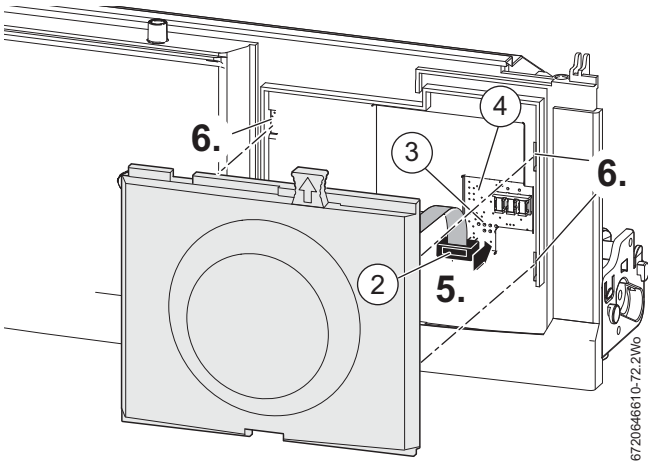


Fig. 46 Connecting the Programmer/Timer

7. Push the Programmer/Timer in to engage with the slots.
8. Pull the Programmer/Timer down to secure with the clips.
9. Replace the top cover panel.
10. Secure in position with the captive screws.

▶ Re-secure the control panel.

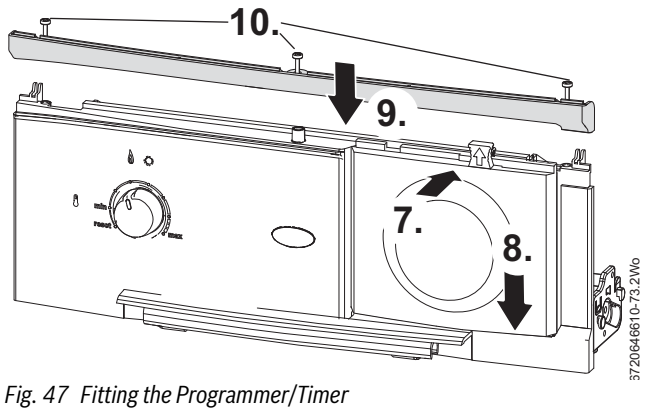


Fig. 47 Fitting the Programmer/Timer

Part number	Description
7 716 192 038	DT20 twin channel digital timer
7 716 192 054	DT20RF digital RF thermostat with twin channel programmer
7 716 192 052	DT10RF Digistat
7 716 192 053	DT10RF Optimiser

NEW INSTALLATIONS

If a new complete heating system installation is in a new build property or is a first time installation in an existing property, heating systems must conform to current building regulations Part L1a.

All new heating systems in dwellings must have at least two heating zones. Each of these zones will be controlled by a thermostat and zone valve.

An alternative would be individual electronically controlled TRVs. Hot water supplied from a storage system would require separate time and temperature control.

If the dwelling is over 150m^2, than a separate time and temperature control for each zone is required.

All radiators must have TRVs fitted in all rooms except bathrooms and rooms with room thermostats.

The exception to this are single storey, open plan dwellings where the living area is more than 70% of the total usable floor area. Then this type of dwelling can be controlled as one zone.

EXISTING INSTALLATIONS

For boiler replacements on an existing system, it is not necessary to zone the upstairs and downstairs separately, compliance with the zone requirements can be achieved by a single room thermostat or programmable room thermostat.

While the system is drained down, TRVs must be fitted to all rooms except the bathrooms and the room with the room thermostat.

SYSTEM WIRING CENTRE CONNECTION

- ▶ Connect external controls LIVE supply to terminal L at the 230V OUT terminal block connection.
- ▶ Connect external controls LIVE return to terminal L_R
- ▶ Connect external controls NEUTRAL to terminal N at the 230V OUT terminal block connection.
- ▶ Refit the control panels.

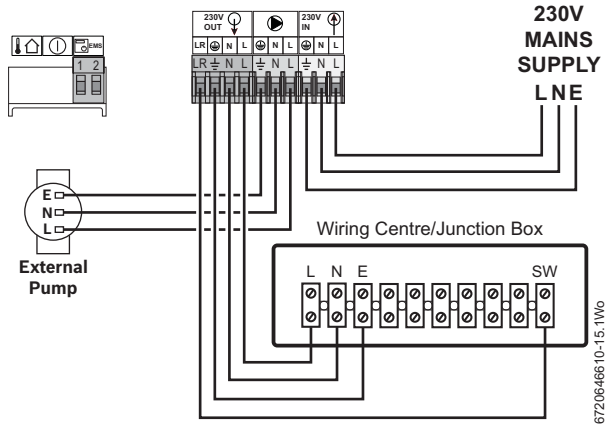


Fig. 48 System wiring centre

GREENSTAR WIRING CENTRE CONNECTION

This method is particularly suited to replacing existing boilers where additional wiring would otherwise be required to a standard system wiring centre, existing wiring can be used to make the BUS connection.

The BUS is a low voltage communication cable and must not be run alongside 230V cables in order to avoid interference.

The connection to the mains power, pump and valves may differ depending on the system installed. The following description is a suggestion on how to carry out the electrical connection of the module.

DANGER: Risk of electric shock

If the heating system is wired in such a way that the Greenstar wiring centre and the boiler have separate points of isolation, then:

- ▶ Attach a warning label to each point of isolation. This label has to advise that this is not the sole point of isolation and also has to identify the location of the other point of isolation.
- ▶ Electrically isolate the boiler and system components. Secure against unintentional re-connection and ensure that the power supply is disconnected.

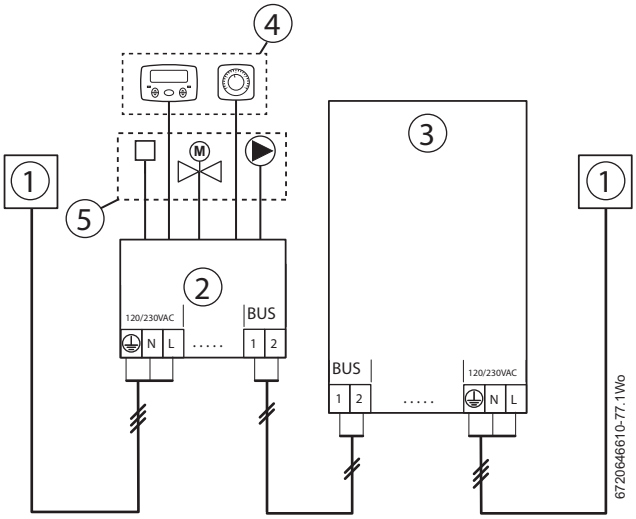


Fig. 49 Example Greenstar wiring centre

[1] Fused spurs
[2] Greenstar wiring centre
[3] Greenstar boiler
[4] External controls
[5] External devices

NOTICE: External devices

- ▶ External diverter valve(s) and all other 230V parts are not supplied with the boiler.
- ▶ Refer to manufacturer's instructions when connecting external parts to the wiring centre.
- ▶ Worcester, Bosch Group cannot be held responsible for wiring errors.

5 COMMISSIONING

5.1 PRE-COMMISSIONING CHECKS

WARNING: ELECTRIC SHOCK
- ▶ ISOLATE THE MAINS SUPPLIES BEFORE STARTING ANY WORK AND OBSERVE ALL RELEVANT SAFETY PRECAUTIONS

- ▶ Check that the gas service pipe and water pipes are connected to the correct position on the manifold.

1. Gas inlet (22mm)
2. Flow (22mm)
3. Return (22mm)

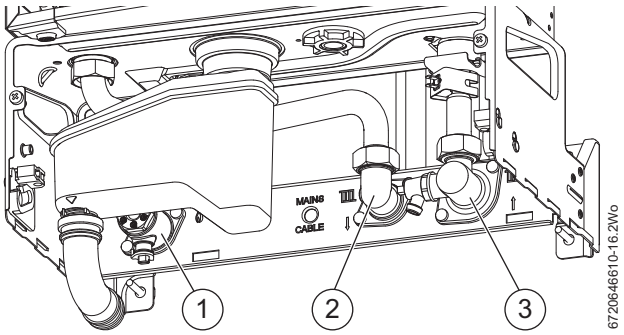


Fig. 50

- ▶ Check the gas type specified on the identification plate matches that of the gas supply.
- ▶ Turn on the main gas supply, check the gas pipe work, connections and rectify any leaks.

NOTICE: Do not use solvents, adhesive or lubricant when pushing the pipe onto the rubber connector.

- ▶ Check that the condensate pipe has been connected to the siphon.
- ▶ Ensure that the condensate pipe has been inserted at least 25mm into the elbow

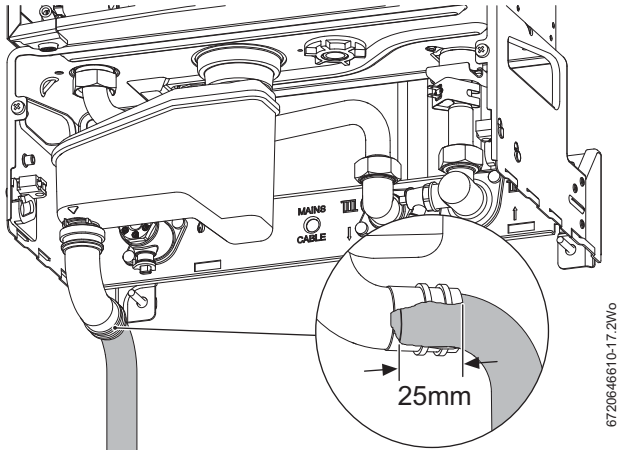


Fig. 51 Condensate connection

If the boiler is not to be commissioned immediately then, after successfully completing all of the checks and any rectification work, shut off the gas and water supply and electrically isolate the boiler.

5.2 FILLING THE SYSTEM

Open vented systems:
- ▶ Ensure all system and boiler drain points are closed.
- ▶ Open all radiator valves.
- ▶ Turn on the water supply to the system header tank and allow the system to fill.

Sealed systems:
- ▶ Fill the system via a WRAS approved filling loop to 1 bar then turn the valve anti-clockwise to close.

Opened vented and sealed systems:
- ▶ Air will be removed from the boiler heat exchanger via the Auto Air Vent mounted on top of the heat exchanger.
- ▶ Vent all radiators and the primary side of the hot water cylinder, tighten when completed and check the system and correct any leaks.

Sealed systems only:
- ▶ If required increase system pressure back to 1 bar.
- ▶ Isolate and remove filling loop connection to system.

5.3 WATER TREATMENT

NOTICE: SOFTENED WATER
- ▶ ARTIFICIALLY SOFTENED WATER MUST NOT BE USED TO FILL THE CENTRAL HEATING SYSTEM.

ENSURE THAT THE SYSTEM HAS BEEN CLEANED AS ON PAGE 9 OF THESE INSTRUCTIONS.

FLUSHING (Central Heating):
- ▶ Switch off the boiler.
- ▶ Open all drain cocks and drain the system while the appliance is hot.
- ▶ Close drain cocks and add a suitable flushing agent at the correct strength for the system condition in accordance with the manufacturer's instructions.
- ▶ Run the boiler/system at normal operating temperature for the time stated by the manufacturer of the flushing agent.
- ▶ Drain and thoroughly flush the system to remove the flushing agent and debris.

INHIBITOR (Central Heating):
- ▶ Check drain cocks are closed and all radiator valves are open before adding a suitable inhibitor compatible with aluminium (or combined inhibitor/anti-freeze if the system is exposed to freezing conditions) to the heating system water in accordance with the manufacturers instructions.

The pH value of the system water must be less than 8 or the appliance guarantee will be invalidated.

- ▶ Fill system as described in section 5.2.
- ▶ Set all controls to maximum.
- ▶ Record the date when the inhibitor was added to the system.

NOTICE:
- ▶ The concentration of inhibitor in the system should be checked every 12 months or sooner if system content is lost.
- ▶ The addition of sealing agents to the system water is not recommended as this can cause problems with deposits left in the heat exchanger.

WATER TREATMENT

Suitable water treatment products can be obtained from the following manufacturers:

FERNOX	0870 601 5000 - www.fernox.com
SENTINEL	0800 389 4670 - www.sentinel-solutions.net

5.4 STARTING THE APPLIANCE

CAUTION: RUNNING THE APPLIANCE
▶ Never run the appliance when the appliance/system is empty or partially filled.

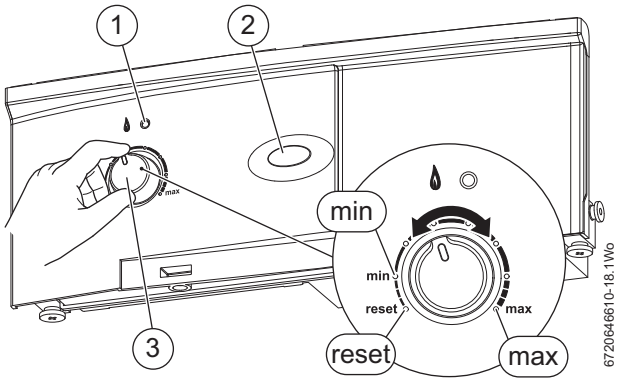


Fig. 52 Control panel

Switching the appliance ON/OFF:

▶ Turn on the mains power supply.
▶ Turn on any external controls
▶ Set the thermostatic radiator controls to maximum temperature
▶ Set the clock/programmer to continuously ON and the room thermostat to maximum temperature

1. The operation and fault Indicator (2) illuminates blue.

1	Burner ON indicator (Green)
2	Boiler operation and fault indicator (Blue)
3	Temperature control

Table 9 Control panel legend

2. Turn the boiler CH temperature control (3) to maximum. The burner on indicator (4) illuminates GREEN when the burner has lit.

▶ If the boiler fails to light and the boiler goes to flame lock-out, the BLUE indicator (2) will flash.

NOTICE: RESET
▶ Do not press the blue Operation/Fault indicator to reset the boiler.

3. To reset the lockout; turn the boiler thermostat control to minimum, then past minimum where the control knob will click at reset position. Wait five seconds then turn to maximum. The boiler will be reset.

5.4.1 SETTING THE APPLIANCE TO SERVICE MODE

For checking the air/gas ratio, inlet pressure and gas rate, the boiler will have to be switched into maximum and minimum output. The service mode can be accessed as follows:

1. Undo the two screw catches.
2. Pull the catches down to release the control panel.
3. Pull the bottom of the panel forward.
4. Lower the control panel to the service position.
5. Release the two screws securing the Installer access cover.
6. Remove the installer access cover.

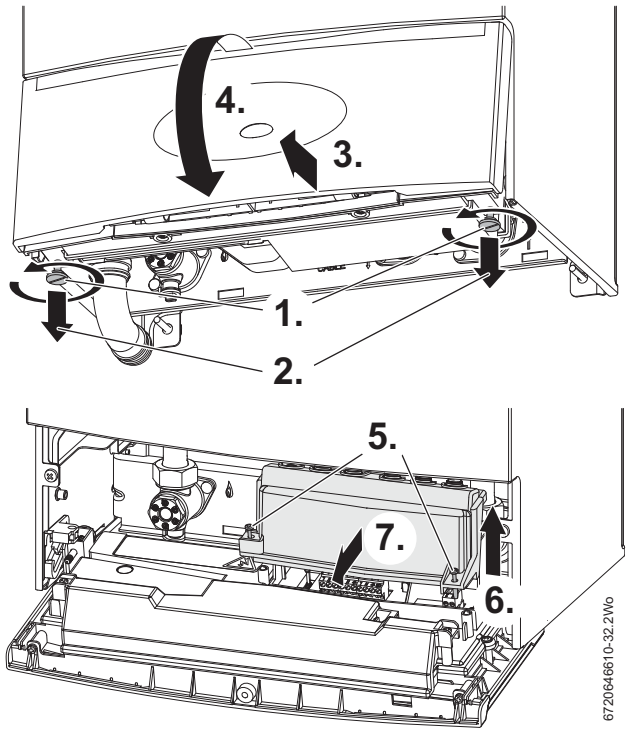


Fig. 53 Control panel to service position

1. Press the service button for more than five seconds and the boiler will go into service mode.
2. The red LED will flash when the boiler is in the service mode.

▶ Turn the control knob to “max.” or “min.” for the desired output, the red LED will flash a five flash sequence for maximum output and a two flash sequence for minimum output.

The blue light on the fascia will also flash at the same rate as the red LED

▶ Press the service button again briefly to switch out of service mode and the LED will stop flashing.

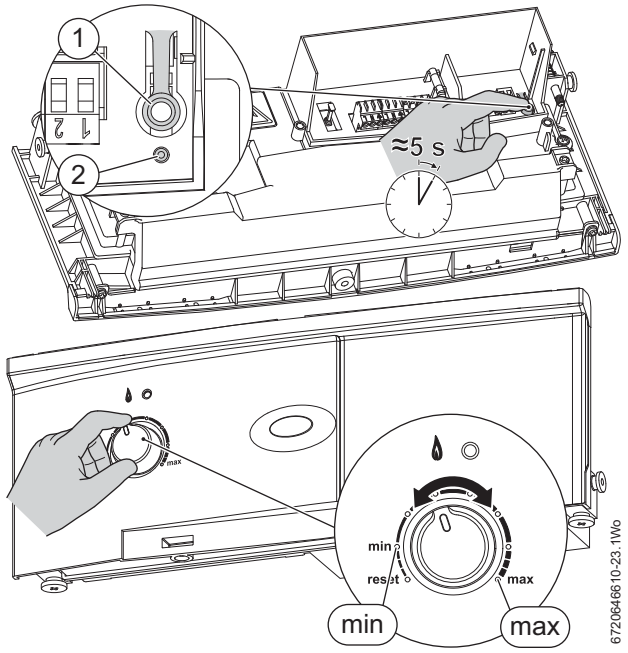


Fig. 54 Service mode

▶ When the checks have been completed and the boiler is returned to normal operation, replace the installer access cover and secure with the screws.
▶ Return the control panel to normal operating position.

5.5 COMMISSIONING

NOTICE: The combustion settings on this gas-fired boiler have been checked, adjusted and preset at the factory for operation on the gas type defined on the data plate.
No measurement of the combustion values is necessary provided there is a meter installed allowing the gas rate to be checked.
DO NOT ADJUST THE AIR/GAS RATIO VALVE.

Check the following points, and then continue with the commissioning:
- ▶ That the boiler has been installed in accordance with the installation instructions.
- ▶ The integrity of the flue system and flue seals.
- ▶ The integrity of the boiler combustion circuit and relevant seals.

5.5.1 CHECKING THE GAS INLET PRESSURE

The inlet pressure to the appliance must be checked using the following procedure:

MEASURING THE INLET PRESSURE

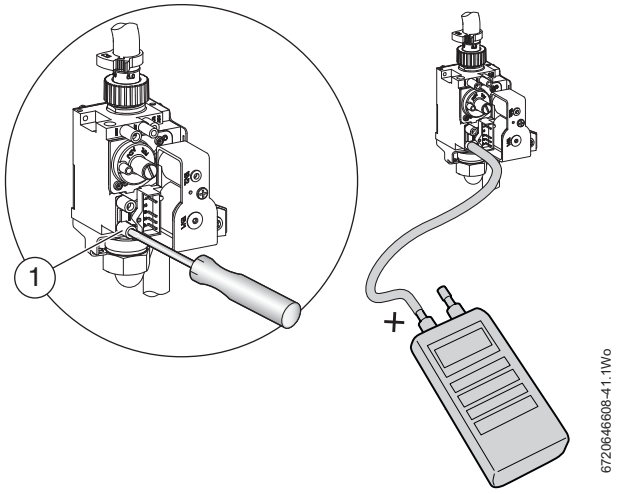


Fig. 55 Inlet pressure test point

- ▶ Close gas isolation valve.
- ▶ Slacken the screw in the inlet pressure test point (1) and connect a manometer.
- ▶ Open gas isolation valve.
- ▶ Measure the pressure with the boiler running at maximum, refer to section 5.4.1.
- ▶ Check the gas supply working pressure at the gas valve conforms to values shown in Fig. 56 or Fig. 57 .

NOTICE: Inlet gas pressure
- ▶ Ensure that the inlet pressure is satisfactory with all other gas appliances working.

GAS PRESSURE WITHIN THE SYSTEM

Refer to the figures below for natural gas or L.P.G gas pressures.
The pressure at the boiler must not be less than the pressure read at the meter less 1 mbar for natural gas and less 2.5mbar for L.P.G.
The pressure drop from the meter to the gas valve must not be more than 2.5 mbar for natural gas or more than 4 mbar for L.P.G.
If the pressure drops are greater than shown below, then this would indicate a problem with the pipe work or connections within the system.

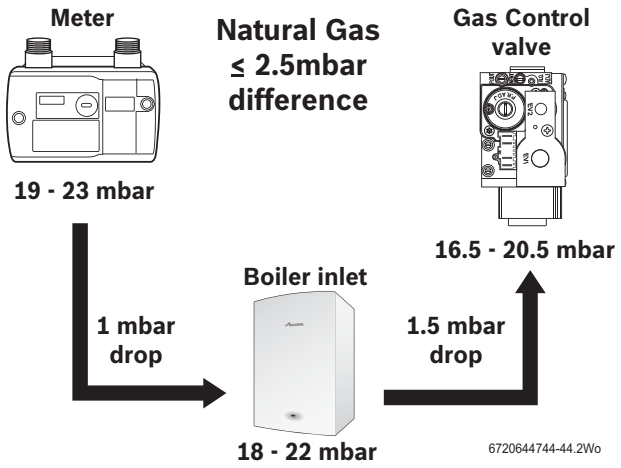


Fig. 56 Natural gas pressures

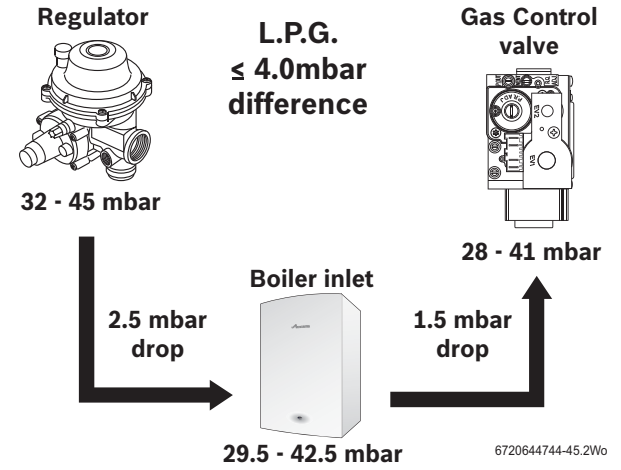


Fig. 57 L.P.G. pressures

NOTICE:
Do not continue commissioning until the correct gas pressure is achieved.

5.5.2 CHECKING THE GAS RATE AND PRESSURE

- ▶ The gas rate should be measured at the gas meter after 10 minutes operation at maximum output.
  See Technical data section on page 8 of this manual.
- ▶ Set the boiler to maximum output (refer to section 5.4.1)
- ▶ Where a gas meter is not available (e.g. L.P.G.) the CO/CO_2 must be checked to the units shown in the setting of the air/gas ratio.

5.5.3 GAS RATING TEST

- ▶ Isolate all other appliances.
- ▶ Set the boiler to maximum output (refer to section 5.4.1).
- ▶ Ensure that there is no modulating of the fan/gas valve.
- ▶ Carry out Gas rating procedures as described in “Essential Gas Safety” third edition on pages 169 to 176.

5.5.4 CHECKING FOR LEAKS DURING OPERATION

- ▶ Use an approved leak detector to check all connections for possible leaks. The product must be certified as a gas leak testing agent.
- ▶ Do not allow the product to come into contact with electrical wiring.

5.6 CO and Combustion checks

The following combustion and flue integrity checks will be 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 flow chart is given for guidance, the details of the checks are given in the following sections:

- Checking flue integrity, refer to section 6.3, page 34
- Flue gas analysis, refer to section 6.6, page 36

NOTICE: BEFORE CO AND COMBUSTION CHECKS:

- Refer to section 5.5.1 and 5.5.2 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 air/gas ratio valve is factory set and must not be adjusted during commissioning unless this action is recommended following contact with the Worcester, Bosch Group help line 0330 123 3366.

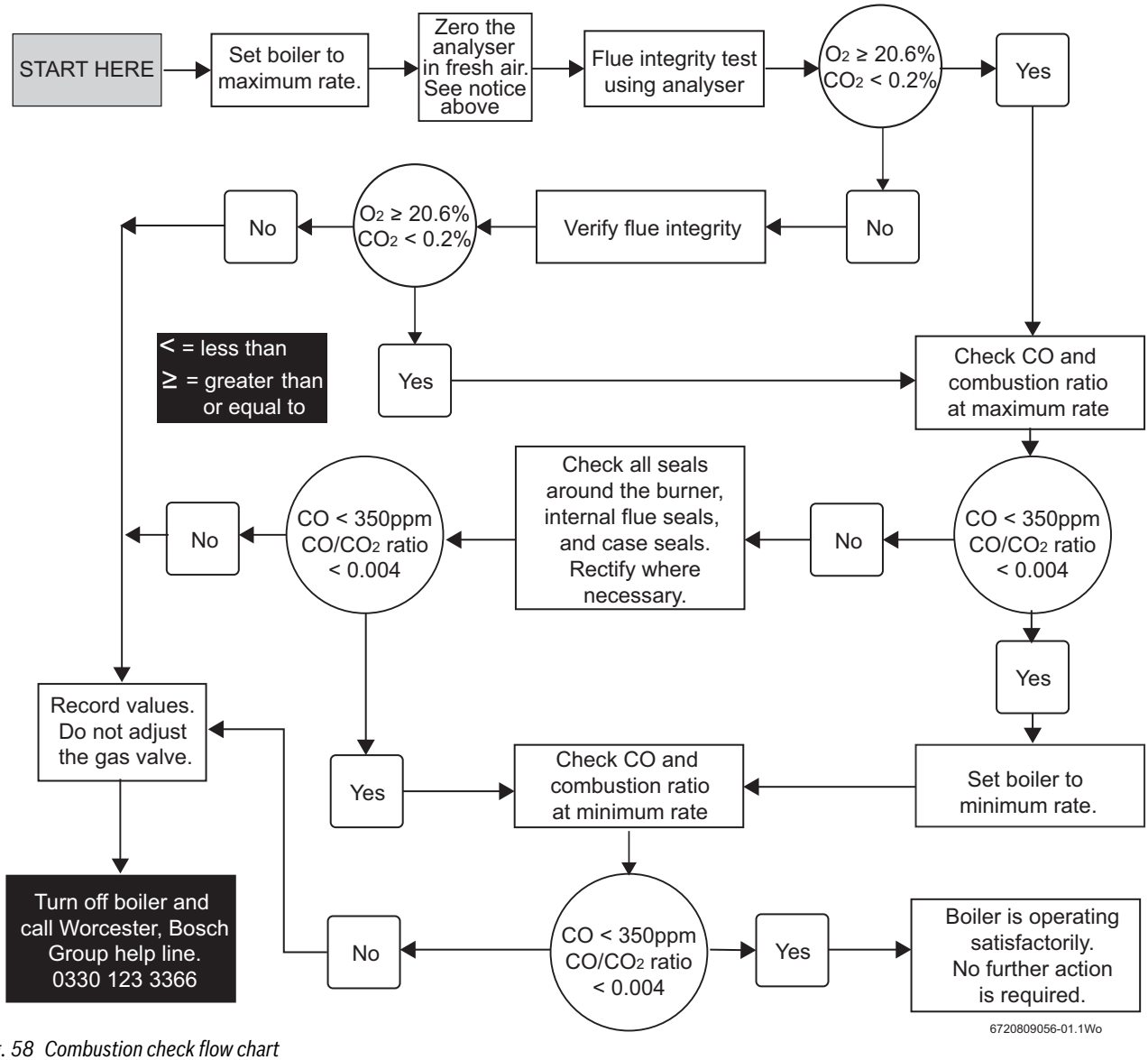


Fig. 58 Combustion check flow chart

5.7 FINISHING COMMISSIONING

5.7.1 REPLACING OUTER CASING:

1. Replace outer casing.
2. Ensure that the securing clips on top of the case are properly located.
3. Tighten bottom two screws (2).
4. Raise the control panel and engage the lugs on the top of the control panel with the chassis.

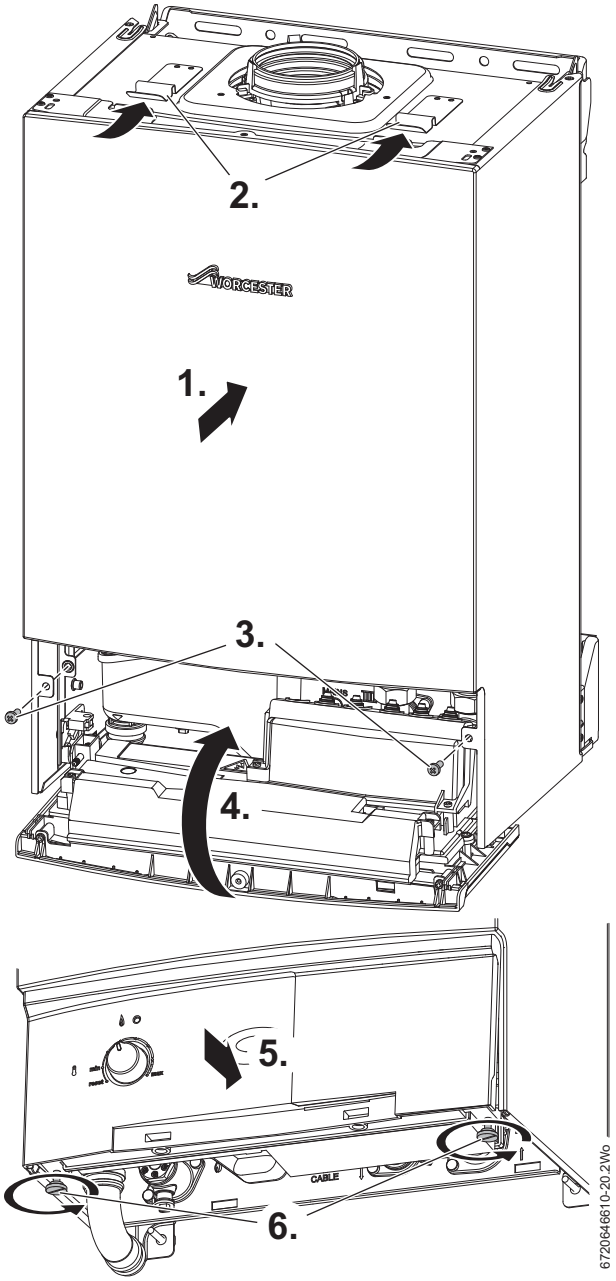


Fig. 59 Fitting case

5.7.2 SECURING THE CONTROL PANEL

5. Push the control panel in to engage the catches at the bottom of the panel.
6. Hand-tighten the two screws to secure the panel.

5.7.3 FITTING FASCIA FLAP

1. Rotate the hinge to be in-line with the flap and present the flap assembly up to the fascia.
2. Push the pegs on the hinge into the slots in the front of the fascia and close the flap.
3. Secure flap to the fascia with the two screws provided.

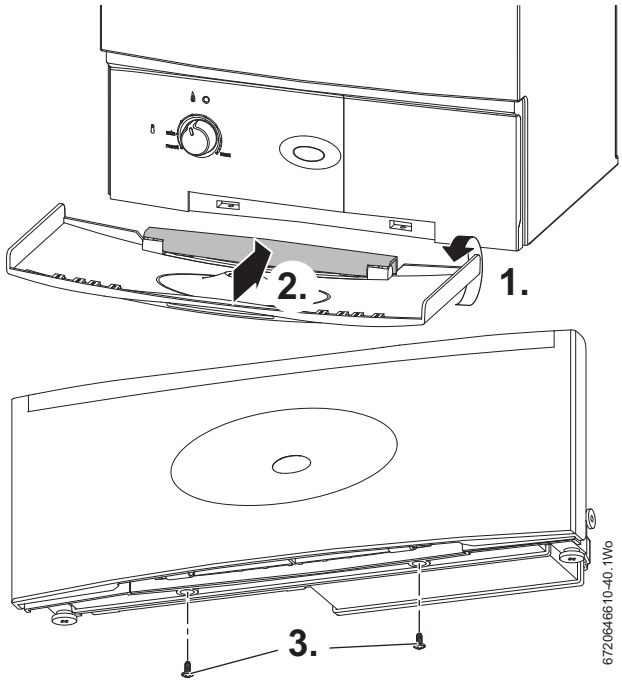


Fig. 60 Fitting fascia flap

5.7.4 INSTALLING BOTTOM PANEL

1. The bottom panel slides onto two ledges either side of the boiler frame.
2. Hold the panel up against the underside of the boiler, align the tabs with the slots and slide towards the rear, until there is no more movement.
3. Ensure that the two catches are fully engaged.

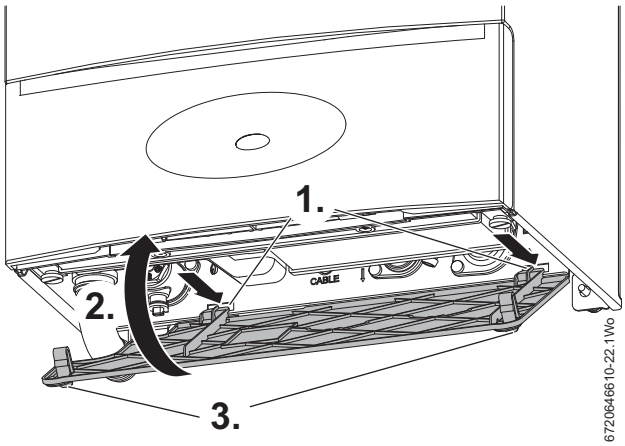


Fig. 61 Bottom panel installation

5.7.5 HANDOVER

▶ Complete the Benchmark Gas Boiler Commissioning Checklist.

The Benchmark Checklist can be found at the rear of these instructions.

▶ Open the fascia flap by hinging the flap downwards using the curved hand hold in the centre of the flap.
▶ Set up the controls and show the customer how to operate all the controls shown in the User Guide plus any external controls.
▶ Instruct the customer on:
  – how to use the TRVs.
  – how to reset the boiler.
▶ Show the customer the fault finding information in the User guide.
▶ Show the customer where the serial number/boiler information is when they call in with a problem (Benchmark checklist at the rear of the manual).
▶ Give the customer details of how to contact the installer/gas emergency numbers.
▶ Show the customer how to safely isolate the boiler
▶ Advise the customer where they can find information on the Worcester, Bosch Group website.
▶ Advise the customer that the varying external temperatures will affect the output of the boiler.
▶ Ensure that the User Guide and Installation, Commissioning and Service manual, with the Benchmark checklist and service record, is left with the boiler or homeowner.
▶ If the appliance is unused and exposed to freezing conditions, shut off all the mains supplies and drain the system and boiler, label accordingly.

5.7.6 BOILER GUARANTEE

This boiler has a guarantee against faulty materials or workmanship for a period of two years from the date of installation subject to the following terms and conditions:

- During the period of this guarantee any components of the boiler which are proven to be faulty or defective in manufacture will be exchanged or repaired free of charge by Bosch Thermotechnology Ltd.
- The householder may be asked to prove the date of installation, that the boiler was correctly commissioned and, where appropriate, the first year's service has been carried out to the satisfaction of Bosch Thermotechnology Ltd., when requested. These should be documented as a part of the Benchmark Checklist.
- The boiler has been used only for the normal domestic purposes for which it was designed.

This guarantee does not affect your statutory rights.

GUARANTEE REGISTRATION

Your Greenstar boiler carries a two year guarantee against faulty material or manufacture subject to Terms and Conditions.

To read the full Terms & Conditions please visit us on-line at www.worcester-bosch.co.uk/guarantee.

The Guarantee Registration form is available on the website.

Register your guarantee in one of three ways:

▶ The on-line form can be completed and submitted electronically.

-or-

▶ Telephone one of our Guarantee Registration advisors on 0844 892 2552.

-or-

▶ Complete the enclosed guarantee card and return by post.

Your statutory rights are not affected by the manufacturer's guarantee.

6 SERVICE AND SPARES

CAUTION: Mains supplies
▶ Turn off the gas supply and isolate the electrical mains supply before starting any work on the appliance and observe all relevant safety precautions.

CAUTION: Component replacement:
▶ After replacement of a gas related component, where a gasket or seal has been disturbed or replaced, check for gas tightness using a gas sniffer/analyser.
▶ Also after re-assembly, carry out the following checks:
Fan pressure in section 6.5,
Flue gas analysis in section 6.6.

NOTICE: Service work
▶ Service work must be carried out by a competent engineer, such as British Gas or Gas Safe registered personnel!

NOTICE: CO/CO_2 ANALYSER
▶ Service work must not be attempted if a CO/CO_2 analyser is not available.

- To ensure continued efficient operation the appliance must be checked at regular interval.
- The frequency of servicing will depend upon the particular installation conditions and usage, however normally an annual service is recommended.
- The extent of the service work required by the appliance is determined by the operating condition of the appliance when tested by qualified engineers.
- After each service, the service interval record sheet at the rear of this manual, must be completed.

6.1 INSPECTION AND SERVICE

1. Check that the terminal and terminal guard, if fitted, are unobstructed and undamaged.
2. If the appliance is in a compartment or cupboard, check that the specified service space around the appliance is clear.
3. Check all joints and connections in the system and remake any that show signs of leakage.
   Refill and re-pressurise if applicable as described in the commissioning section.
4. Operate the appliance and take note of any irregularities.
   Refer to the fault finding pages for rectification procedure.

6.1.1 DRAINING THE BOILER

Many of the tasks in this section require that the boiler be isolated and drained.

1. Connect a suitable hose firmly to the drain point and run the hose outside to a suitable point or container.
2. Turn the drain valve a quarter turn anti-clockwise to open the drain. Turn the valve firmly clockwise to close.

6.2 CHECKING THE GAS INLET PRESSURE

NOTICE:
- ▶ Ensure that the gas pressure is satisfactory with all other gas appliances working.
- ▶ Do not continue with the other checks if the correct gas pressure can not be achieved.

▶ Check that the gas working pressures in the system conform to the figures shown in section 5.5.1:

6.3 CHECKING FLUE INTEGRITY

The integrity of the flue system and performance of the boiler can be checked via the flue turret sample points.

Flue gas sample point	1
Air inlet sample point	2

Table 10 Key to figure 62

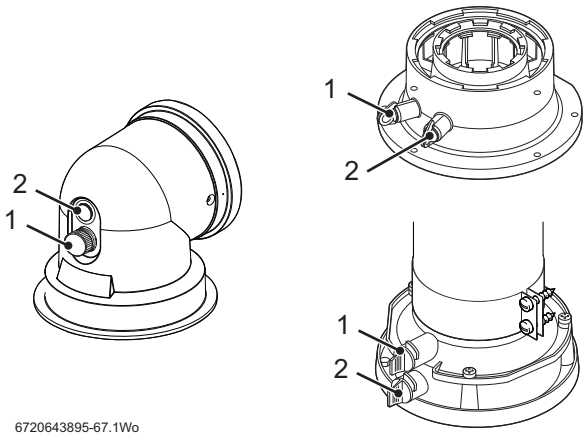


Fig. 62 Flue turret test points

With the boiler case on and the boiler running at maximum output (refer to section 6.5.1 “Setting the boiler to maximum”).

- ▶ Ensure that the probe reaches the centre of the air intake, adjust the cone on the probe so that it seals the sample point and correctly positions the end of the probe.
- ▶ Insert the analyser probe into the air intake sample point.
- ▶ Allow the readings to stabilise and check that:
  - O_2 is equal to, or greater than 20.6%.
  - CO_2 is less than 0.2%
- ▶ If the readings are outside these limits then this indicates that there is a problem with the flue system or combustion circuit, e.g. missing or dislodged seals.

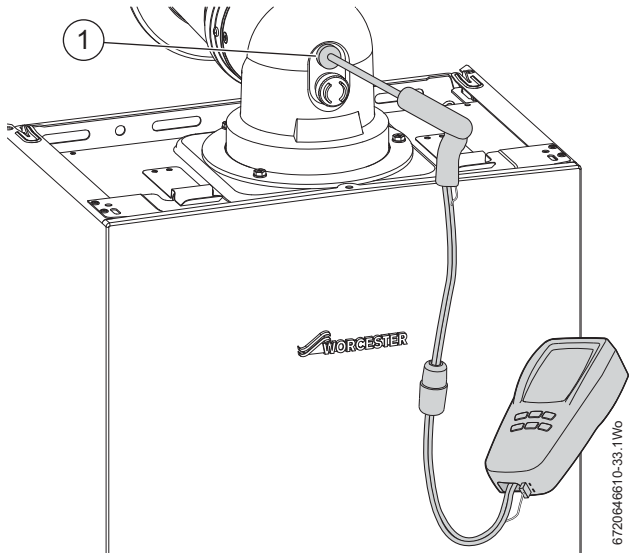


Fig. 63 Flue integrity test

6.4 COMPONENT ACCESS

To remove the outer case, to gain access to the components:

1. Remove the bottom panel.
2. Release the two screws securing the control panel.
3. Pull down to release the two catches.
4. Pull the bottom of the control panel forward and down.
5. Lower the control panel into the service position
6. Undo and remove the two bottom retaining screws.
7. Lift the spring clips on top of the case.
8. Pull the case towards you to remove.

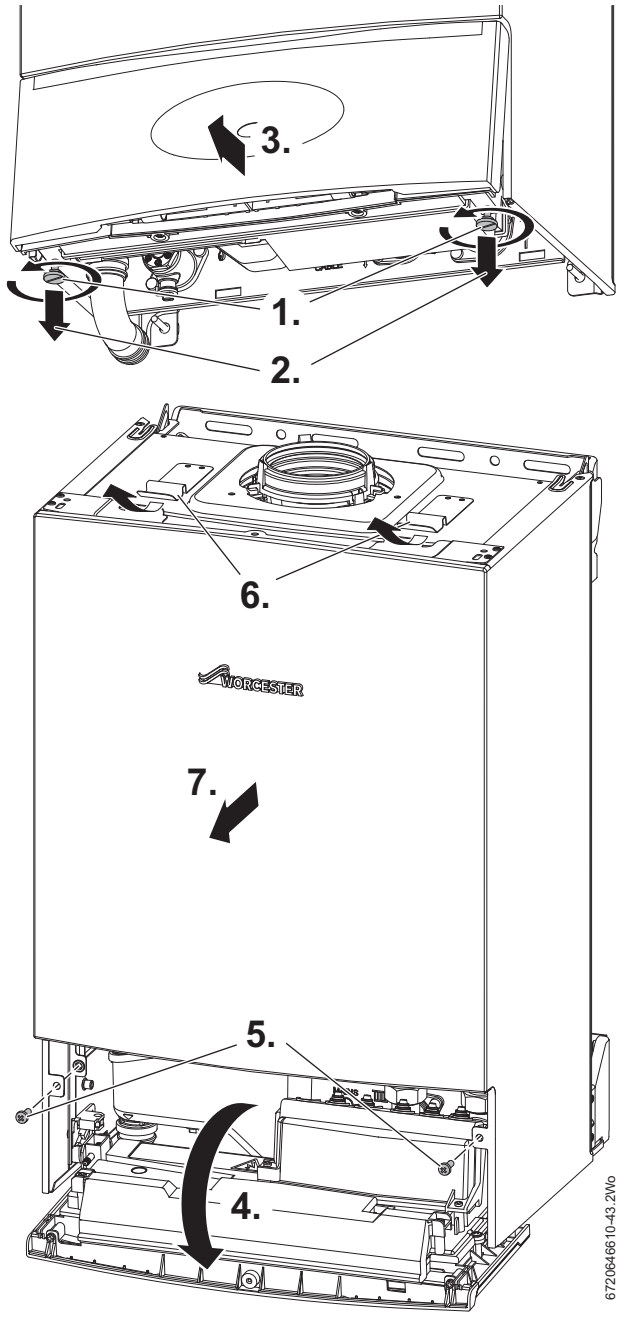


Fig. 64 Component access

6.5 FAN PRESSURE TEST

This test is to determine if the heat cell requires cleaning or attention.

Before setting the boiler to maximum output for the fan pressure test, refer to figure 66:

- ▶ Switch the boiler off.
- ▶ Remove the combustion air intake pipe (1).
- ▶ Remove the fan pressure test point cover (2).
- ▶ Connect the digital manometer pipe (3) to the fan pressure test point (4).
- ▶ Replace the combustion air intake pipe.
- ▶ Switch the boiler on.
- ▶ Set the boiler to maximum output.

6.5.1 SETTING THE BOILER TO MAXIMUM

To set the boiler to maximum output:

- ▶ With the Control panel in the service position, press the Service mode button (1) for more than five seconds.
  - – The red L.E.D. (2) will flash.
  - – Turn the control knob to “max” and boiler will go to maximum output, the red L.E.D. will give a five flash sequence.
- ▶ Turn the central heating control to maximum to ensure that the fan/ gas valve do not modulate.

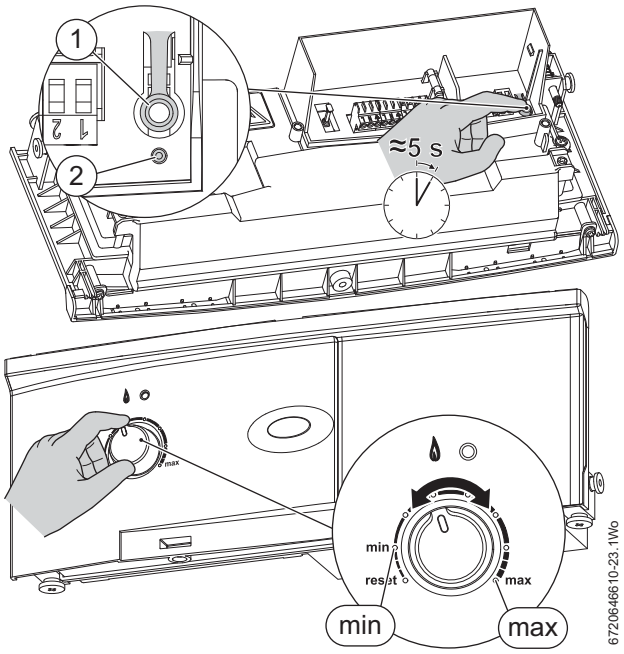


Fig. 65 Setting boiler to maximum

6.5.2 FAN PRESSURE

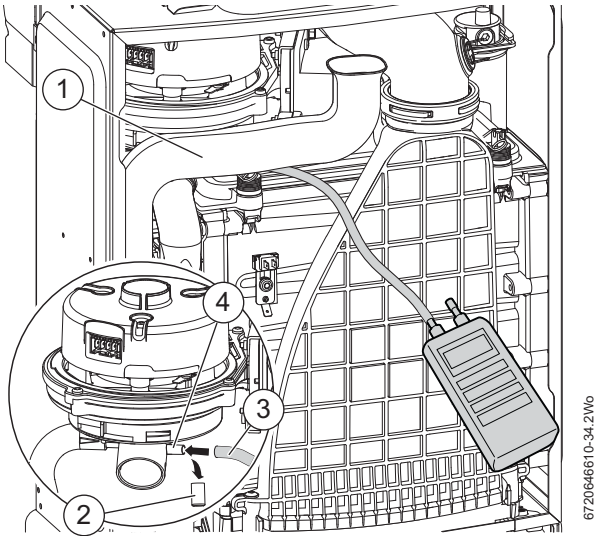


Fig. 66 Fan pressure test point

NOTICE: Fan pressure test

- ▶ The boiler must be run at maximum output for the fan pressure test and flue gas analysis.

With the combustion air intake pipe fitted and the boiler running at maximum output, measure the fan pressure:

- ▶ The pressure will read negative, refer to the chart in figure 67 below.

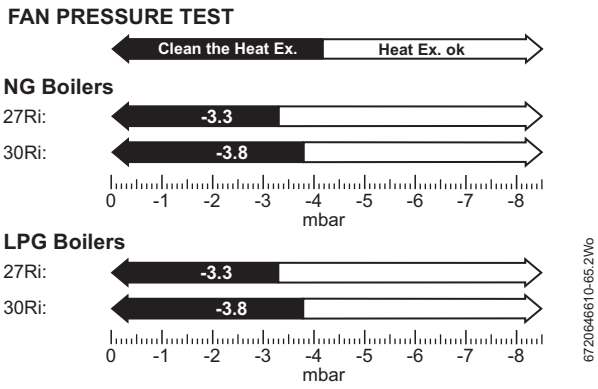


Fig. 67 Fan pressure readings

- ▶ If the manometer reading is in the white area of the chart the heat exchanger/exhaust path/siphon does not require attention.
- ▶ If the manometer reading is in the black area of the chart then carry out the following checks:
  - – Check that the siphon is not blocked.
  - – Check the exhaust paths for restrictions.
  - – Clean the heat exchanger with a suitable cleaning tool, refer to section 6.7 - Cleaning the heat exchanger.
- ▶ Re-check the fan pressure readings.

If the boiler, after completing the above checks, fails the fan pressure test then contact Worcester, Bosch Group for advice.

- ▶ After the measurements are taken switch the boiler off.
- ▶ Remove the combustion air intake pipe.
- ▶ Disconnect the manometer and replace the test point cover.
- ▶ Replace the combustion air intake pipe.

6.6 FLUE GAS ANALYSIS

NOTICE: Combustion testing
- ▶ Combustion testing must be carried out by a competent person. Testing must not be attempted unless the person carrying out the combustion check is equipped with a Combustion Analyser conforming to BS 7927 and is competent in its use.

NOTICE: Gas inlet pressure
- ▶ Ensure that the gas inlet pressure has been checked and is satisfactory, refer to section 5.5.1

COMBUSTION TEST

- ▶ Connect the flue gas analyser to the flue gas sampling point (1) as shown in the figure below.
- ▶ Ensure that the probe reaches the centre of the flue gas exhaust, adjust the cone on the probe so that it seals the sample point and correctly positions the end of the probe.
- ▶ With the Control panel in the service position, press the Service mode button (1) for more than five seconds.
  - – The red L.E.D. (2) will flash.
  - – Turn the control knob to “max” and the boiler will go to maximum output and the L.E.D. will flash in a five flash sequence.

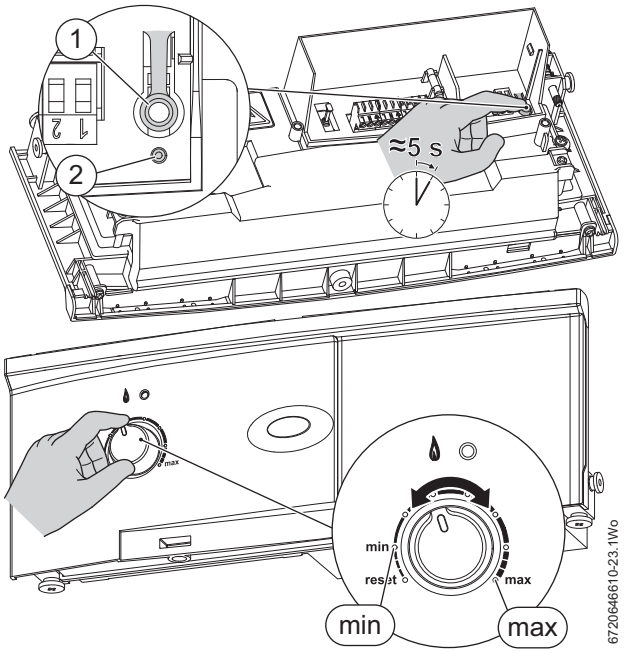


Fig. 68 Setting boiler to maximum

- ▶ Run the boiler at maximum output for at least 10 minutes.
- ▶ Check the CO/CO_2 readings against the information in table 11.

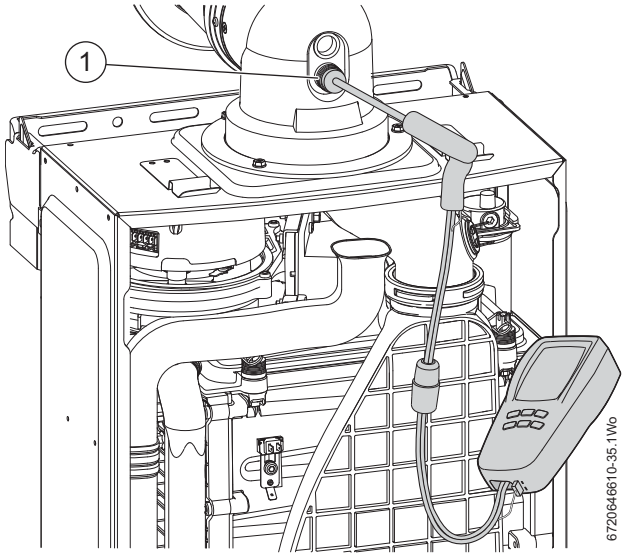


Fig. 69 Combustion test

- ▶ Check CO is less than 200ppm.
- ▶ Turn the control knob to “min” and the boiler will go to minimum output.
  - – The LED will flash in a two flash sequence.
- ▶ Check that the CO is less than 200ppm.
- ▶ Return the boiler to maximum output, by turning the control knob to “max”, and re-check the CO/CO_2.
  - – The LED will flash in a five flash sequence.
- ▶ If correct, press the Service mode button once and the boiler will return to normal operation, the LED will not be illuminated.
- ▶ Re-assemble and refit boiler case.

NOTICE: Minimum CO2
- ▶ The minimum CO_2 reading must be at least 0.2 lower that the maximum CO_2 reading.

Note: Natural Gas and L.P.G. minimum CO_2 has a tolerance of plus 1.0% to minus 0.5%

CO/CO_2 settings for Greenstar Compact range of boilers CO/CO_2 should be measured after 10 minutes		
Gas type	CO_2 max.	CO_2 min.
Natural gas	9.1% +1 / – 0.5	8.5% ± 1
LPG	10.6% +1/ – 0.5	9.6% ± 1
CO - less than 250ppm (0.0025 ratio)		

Table 11 CO/CO_2 settings

If the boiler fails the combustion test, check:

1. Air intake for restriction
2. Cleanliness of the heat cell, condition of the burner, plus blockages in the condensate disposal.

6.7 CLEANING THE HEAT EXCHANGER

NOTICE: Gaskets and seals
- ▶ Replace the burner and electrode assembly gaskets and the Flueway sump seal after cleaning the heat exchanger.
  Do not attempt the cleaning procedure unless new gaskets and seals are available.

There is an optional tool available to assist in cleaning the heat exchanger,
part number 7 746 901 479

The following items will have to be removed to gain access to the heat exchanger for cleaning:
- ▶ Lower the control panel into the service position.
- ▶ Remove the case.
- ▶ Disconnect electrical wires to the fan, ignition transformer, spark electrodes, flue overheat thermostat, main heat exchanger temperature sensor and flow pipe temperature sensor.
- ▶ Flueway
- ▶ Fan assembly
- ▶ Ignition transformer
- ▶ Spark electrode assembly
- ▶ Burner housing, burner and gasket

Refer to sections 6.8.9 to 6.8.13 for instructions on how to remove the items to gain access to the heat exchanger channels so that the heat exchanger can be cleaned

6.7.1 CLEANING THE SIPHON

- ▶ The Control panel will have to be removed to gain access to the siphon for removal and cleaning, refer to section 6.8.3

1. Disconnect the discharge hose from the condensate pipe.
2. Rotate the siphon body clockwise to release the bayonet connection.
3. Pull the siphon body down and away from the boiler.

- ▶ Empty the water and debris into a suitable container.
- ▶ Visually inspect the siphon to ensure that it is clean and free from debris.
- ▶ Fill the siphon with 200 to 250ml of clean water before refitting.

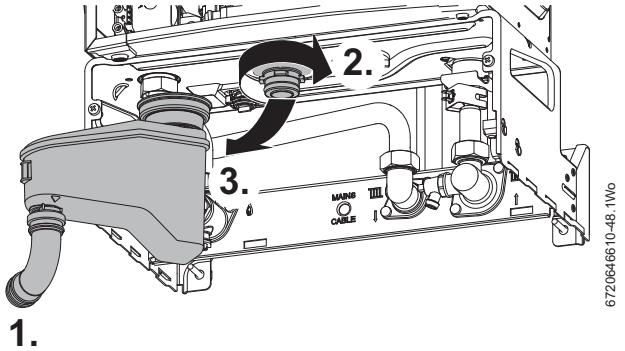


Fig. 70 Cleaning the siphon

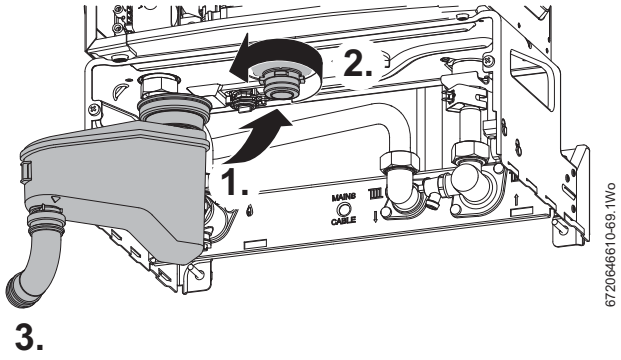
REFITTING THE SIPHON

- ▶ Fill siphon with 200 to 250 millilitres of water.

1. Push the siphon up onto the sump assembly until it fully engages with the sump connection.

NOTICE: Do not use solvents, adhesive or lubricant when pushing the pipe onto the rubber connector.

2. Twist the siphon to the left to secure the bayonet connection.
3. Push the discharge hose, onto condensate pipe so that at least 25mm of the condensate pipe is inserted into the discharge hose.



3.

Fig. 71 Fitting siphon

CAUTION: Component replacement:
- ▶ After replacement of a gas related component, where a gasket or seal has been disturbed or replaced, check for gas tightness using a gas sniffer/analyser.
- ▶ Also after re-assembly, carry out the following checks:
  Fan pressure in section 6.5,
  Flue gas analysis in section 6.6,

6.7.2 CLEANING THE PRIMARY HEAT EXCHANGER

SINGLE BLADED TOOL AND BRUSH

Use a suitable blade to clean the heat exchanger channels.
There is an optional tool available to clean the heat exchanger, part number 7 746 901 479.

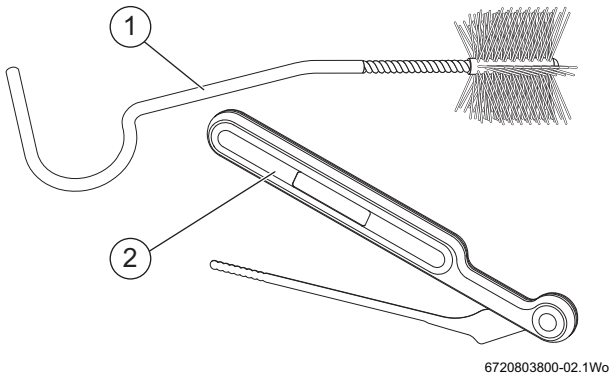


Fig. 72 Single-bladed cleaning tool and brush

- ▶ Visually inspect the inside of the heat exchanger by shining a torch from the top down into the sump area.
- ▶ When there is little or no light visible this would suggest that those channel(s) are restricted.
- ▶ It is recommended that all channels are cleaned.
- ▶ Remove the siphon and place a suitable container under the outlet to catch the water and debris.
- ▶ Protect the controller from water ingress.

To clean the rear and middle channel of the heat exchanger

1. Orient the cleaning tool (2) as shown in figure 73 and insert the tool into the rear or middle channels for cleaning.
2. Move the cleaning tool handle in an up and down motion, using the front edge of the heat exchanger as a pivot, to clean the channel.

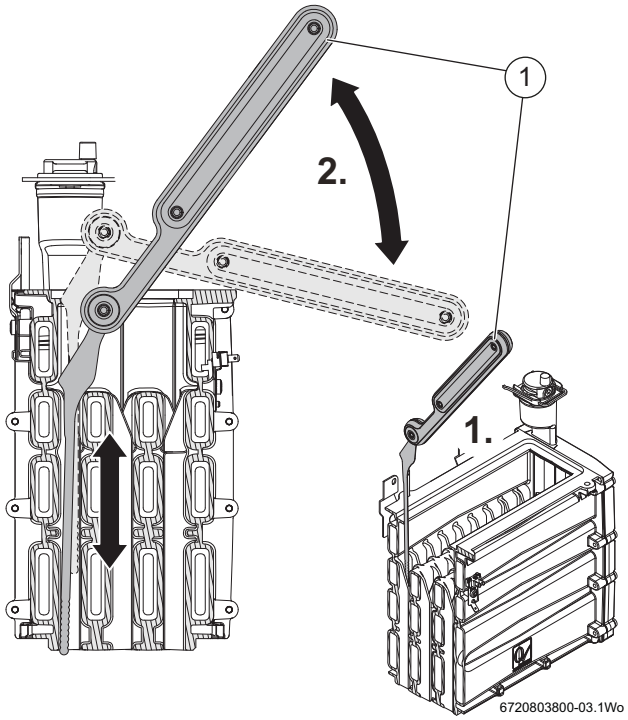


Fig. 73 Heat exchanger cleaning tool

To clean the front channel of the heat exchanger

3. Orient the cleaning tool (2) as shown in figure 74 and insert the tool into the front channel for cleaning.
4. Move the cleaning tool handle in an up and down motion, using the front edge of the heat exchanger as a pivot, to clean the channel.

▶ Use the brush to dislodge the debris and pour water down the channels to flush out the debris.

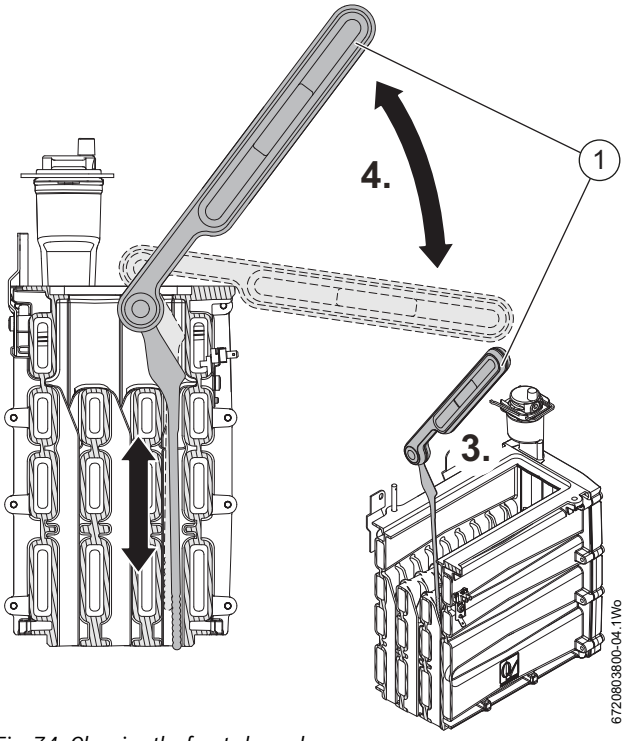


Fig. 74 Cleaning the front channels

On completion of the heat exchanger cleaning and re-assembly, perform the fan pressure test as described in section 6.5.2

6.8 REPLACEMENT OF PARTS

CAUTION: Mains supplies:
▶ Turn off the gas supply and isolate the mains supplies before starting any work on the boiler and observe all relevant safety precautions.

CAUTION: Component replacement:
▶ Replace the burner housing gasket and the Flueway sump seal when re-assembling the heat exchanger. Do not reassembly the heat exchanger and Flueway until new gaskets and seals are available.
▶ After replacement of a gas related component, where a gasket or seal has been disturbed or replaced, check for gas tightness using a gas sniffer/analyser.
▶ On re-assembly check all affected seals for cracks, hardness and deterioration. If damaged or in any doubt the seal must be replaced.
▶ Also after re-assembly, carry out the following checks:
Fan pressure in section 6.5,
Flue gas analysis in section 6.6.

6.8.1 REMOVING THE OUTER CASE

Remove the bottom panel:

1. Push in the two catches to release.
2. Lower the bottom panel slightly.
3. Slide forward to remove.

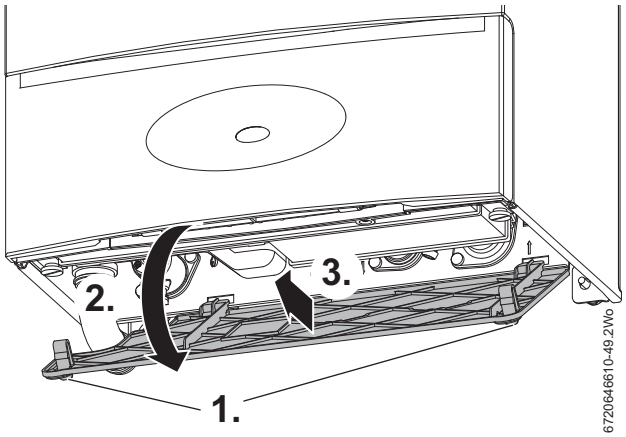


Fig. 75 Bottom panel

To remove the outer case, to gain access to the components:

1. Release the two screws securing the control panel.
2. Pull down to release the two catches.
3. Pull the bottom of the control panel forward and down.
4. Lower the control panel into the service position
5. Undo and remove the two bottom retaining screws.
6. Lift the spring clips on top of the case.
7. Pull the case towards you to remove.

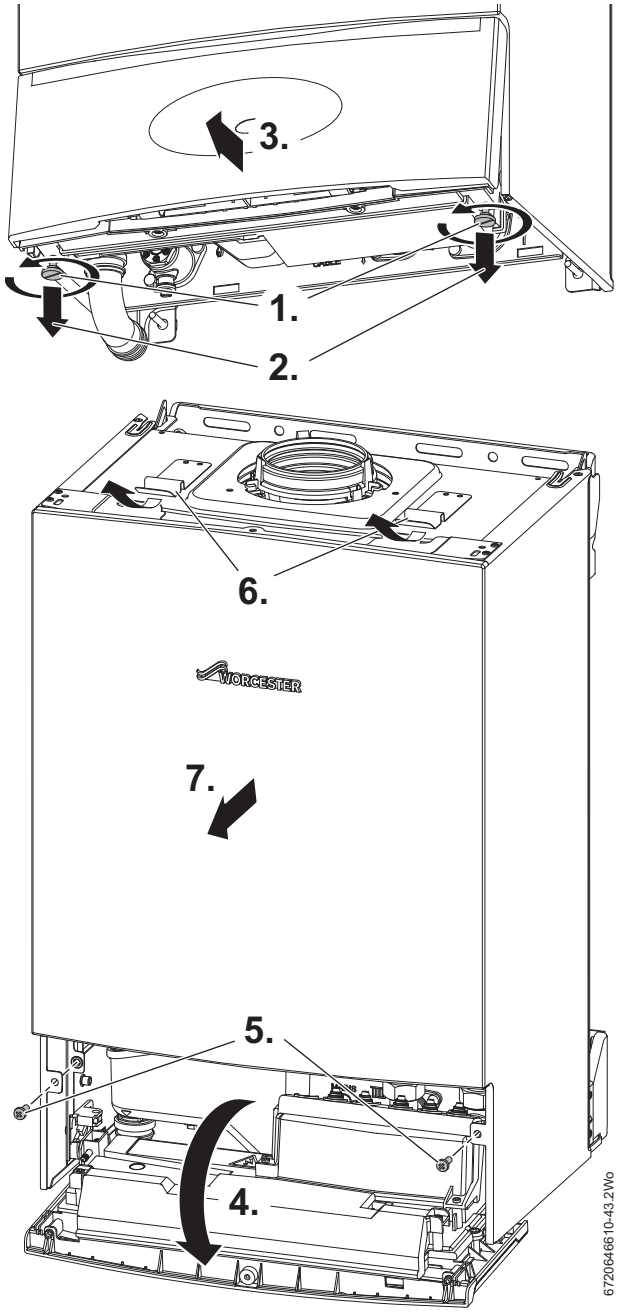


Fig. 76 Removing outer case

6.8.2 DRAINING THE BOILER

Many of the tasks in this section require that the boiler be isolated and drained.

1. Connect a suitable hose firmly to the drain point and run the hose outside to a suitable point or container.
2. Turn the drain valve a quarter turn anti-clockwise to open the drain. Turn the valve firmly clockwise to close.

6.8.3 SIPHON REMOVAL

The Control panel will have to be removed to gain access to the siphon for cleaning or removal.

ACCESS TO THE SIPHON

The Control panel must be removed from the hinges to give enough access to fit the siphon.

1. Swivel the control panel down to an angle of approximately 60° from the horizontal.
2. Pull the Control panel up to release the panel from the hinges.

▶ Allow the Control panel to hang on the cables and support strap.

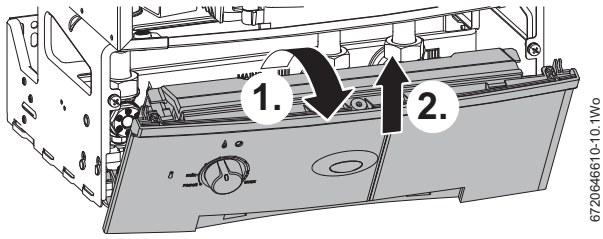


Fig. 77 Control panel removal

1. Disconnect the discharge hose from the siphon.
2. Rotate the siphon body clockwise to release the bayonet connection.
3. Pull the siphon body down and away from the boiler.

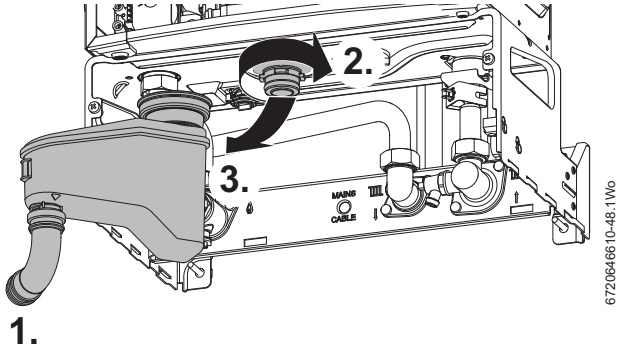


Fig. 78 Siphon removal

▶ The control panel can be refitted by holding the panel at approximately 60° to the horizontal and engaging the panel into the hinge slots.

6.8.4 PRIMARY SENSOR (CH NTC)

▶ Remove the combustion air inlet pipe from the pre-mix unit, rotate anti-clockwise and pull away from the fan assembly.
▶ Ease the gas pipe to the left.
▶ Disconnect the electrical connectors to the sensor.
▶ Remove the sensor by pulling forward.
▶ Replace the sensor onto the flow pipe, ensure that the sensor element is in contact with the pipe and that the clip is secure.
▶ Connect the lead to the sensor.
▶ Re-fit the combustion air inlet pipe to the pre-mix unit.

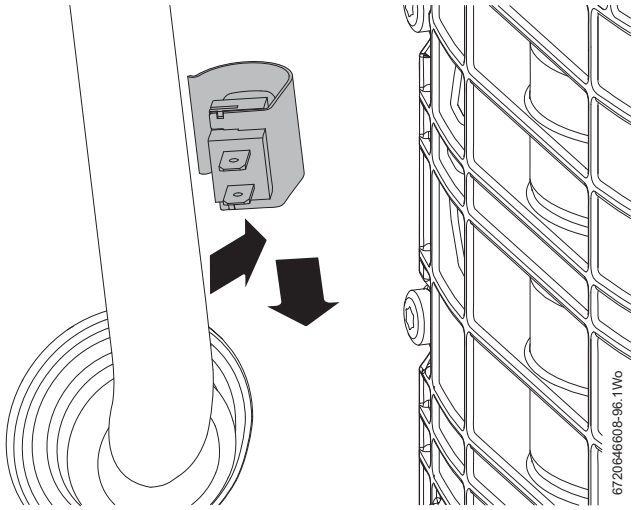


Fig. 79 Primary sensor

6.8.5 "MAXIMUM SAFETY SENSOR"

▶ Disconnect the electrical connectors to the "Maximum safety sensor".

1. Remove the screw securing the sensor.
2. Remove the sensor from the heat exchanger.

▶ When replacing the sensor, ensure that the assembly is properly located on the orientation pin.

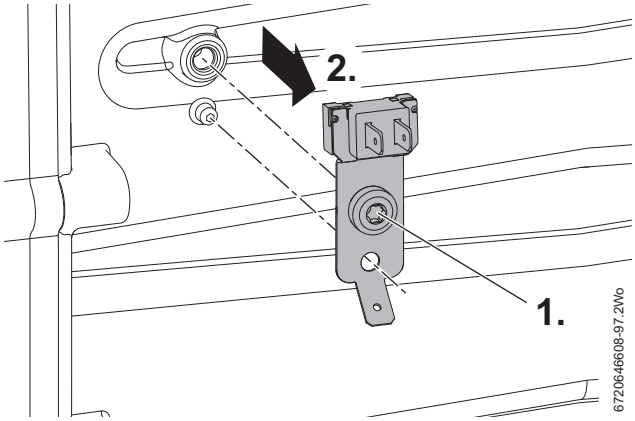


Fig. 80 Overheat sensor

6.8.6 FLUE OVERHEAT THERMOSTAT

▶ Disconnect the lead to the thermostat.

Take care not to damage the housing when removing the thermostat.

▶ Using a small screwdriver, gently prise the thermostat from the housing taking care not to damage the housing or grommet.

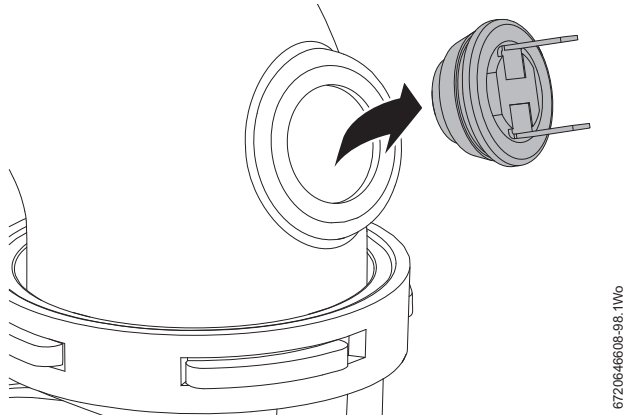


Fig. 81 Flue overheat thermostat

▶ To replace, push the thermostat and new grommet gently back into the opening until contact with the locating ridge is felt.

▶ The Flueway will have to be removed if the thermostat falls into the housing, refer to section 6.8.9.

6.8.7 AUTO AIR VENT

Ensure that the boiler has been fully drained.

1. Remove the spring clip completely.
2. Lift the air vent out of the housing and remove.

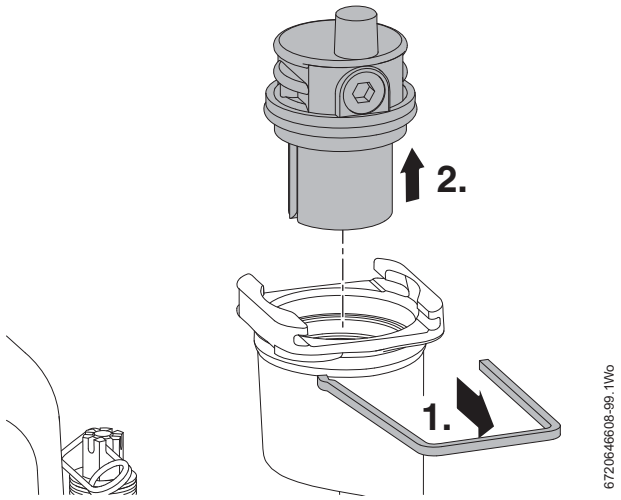


Fig. 82 Auto air vent

When re-assembling ensure that the "O" ring is fitted to the Auto air vent and NOT the heat exchanger, otherwise the Air vent will be difficult to fit.

Apply silicone grease to the "O" ring to ease assembly.

6.8.8 GAS VALVE

▶ Isolate the gas supply at the boiler gas cock.

▶ Remove the combustion air inlet pipe.

▶ Disconnect the electrical connector from the valve

1. Remove the gas pipe from the top of the valve.
2. Undo the bottom gas pipe connection.
3. Remove the screw securing the gas valve.
4. Lift the gas valve to clear the bottom gas connection.
5. Pull the gas valve forward out of the boiler.

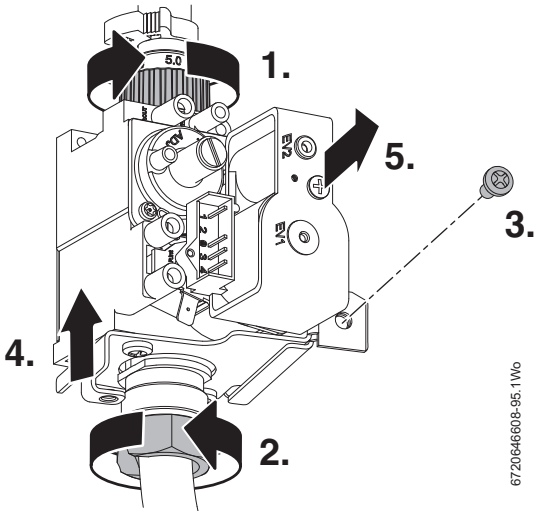


Fig. 83 Gas valve

▶ When fitting the new valve, start the bottom gas connection and tighten by hand before making any other connections to the valve.

▶ Secure the valve with the screw.

▶ Tighten the bottom connection firmly with a suitable spanner.

▶ Connect the top gas pipe.

▶ Reconnect the electrical connector.

▶ Check that all the gas connections for gas tightness.

▶ Open the boiler gas isolator.

6.8.9 FAN ASSEMBLY

CAUTION: Component replacement:
- ▶ After replacement of a gas related component, where a gasket or seal has been disturbed or replaced, check for gas tightness using a gas sniffer/analyser.
- ▶ On re-assembly check all affected seals for cracks, hardness and deterioration.
  If damaged or in any doubt the seal must be replaced.
- ▶ Also after re-assembly, carry out the following checks:
  Fan pressure in section 6.5,
  Flue gas analysis in section 6.6.

To remove the fan the following components will have to be removed first:
- Flueway
- Combustion air inlet pipe and gas pipe

FLUEWAY REMOVAL

CAUTION: Flueway sump seal.
- ▶ Replace the sump seal every time that the Flueway to sump connection is disturbed.

1. Release the two screws securing the Flueway to the sump.
2. Using a screwdriver under the tabs (1) next to the screws, lever the Flueway up to clear the seal and pull the Flueway forward.
3. Rotate the exhaust pipe to the left and pull the Flueway down to separate from the exhaust pipe.

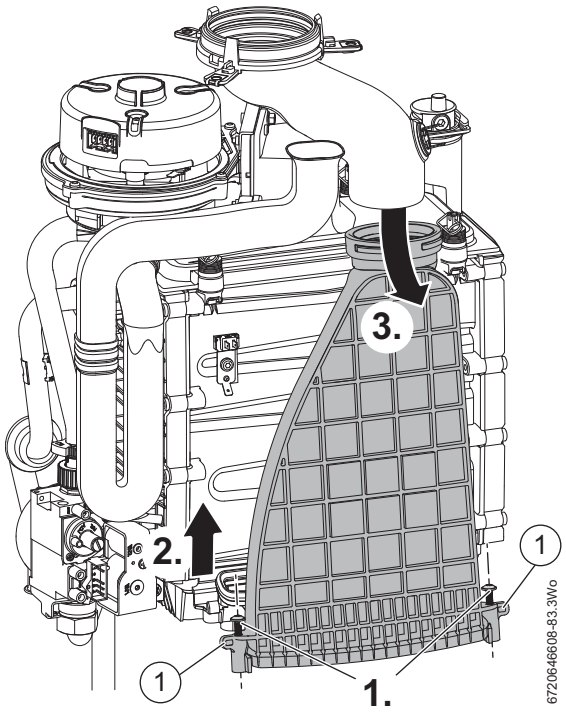


Fig. 84 Flueway removal

REMOVE THE USED SEAL

4. Discard the "tubular" seal [2] or the "moulded" seal [3], depending on which type is fitted and replace with the seal that is provided.

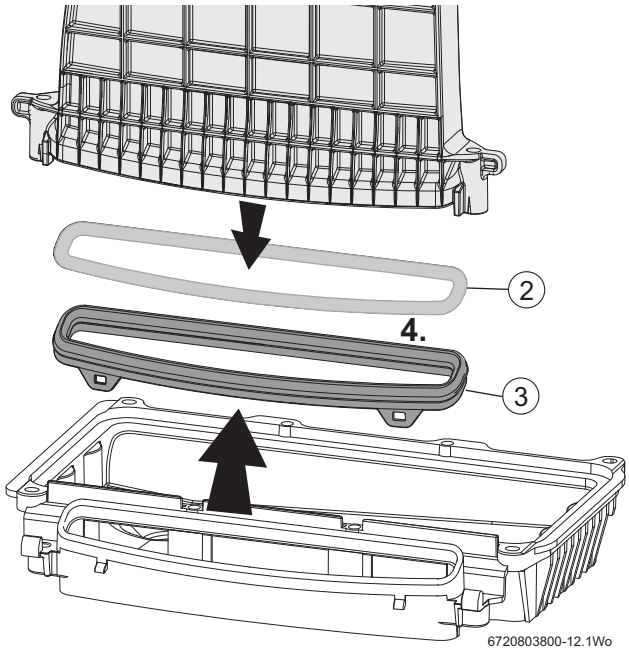


Fig. 85 Remove the existing seal

FITTING THE "MOULDED" SUMP SEAL

1. Place the seal [3] on the sump interface.
2. Ensure that the lug flaps are mounted onto the sump lugs.

Before fitting the Flueway:
- ▶ Ensure that the seal is clean and free from debris.

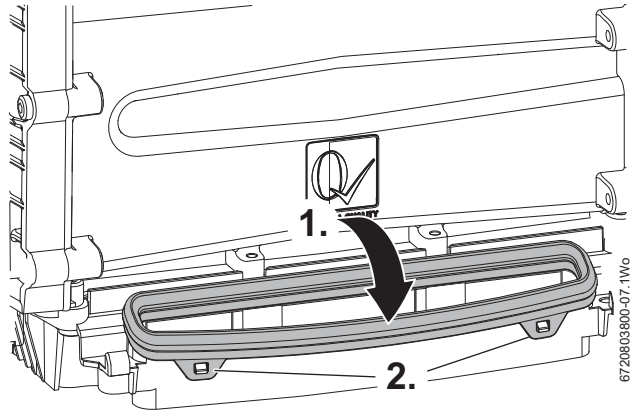


Fig. 86 Moulded style seal

FITTING THE "TUBULAR" SUMP SEAL

3. Fit the Flueway sump seal [2] into the Flueway.
   Ensure the seal is fitted fully into the recess in the underside of the Flueway.

Before fitting the Flueaway:
- ▶ Ensure that the seal is clean and free of debris.

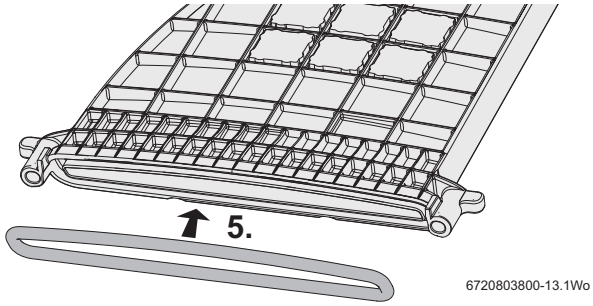


Fig. 87 Tubular style sump seal

COMBUSTION AIR INLET AND GAS PIPE DISCONNECTION

1. Rotate the combustion air inlet pipe anti-clockwise to release from the fan assembly and pull away from the fan.
2. Undo the top gas pipe connector at the gas valve.

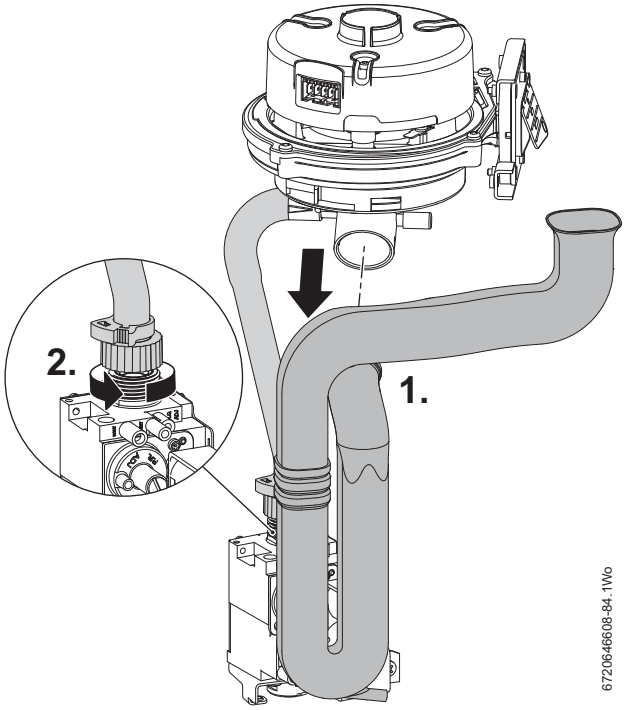


Fig. 88 Combustion air inlet pipe removal

FAN REMOVAL

3. Rotate the exhaust pipe anti-clockwise to gain access to the fan assembly securing screws.
4. Support the weight of the fan and remove the two screw securing the fan.

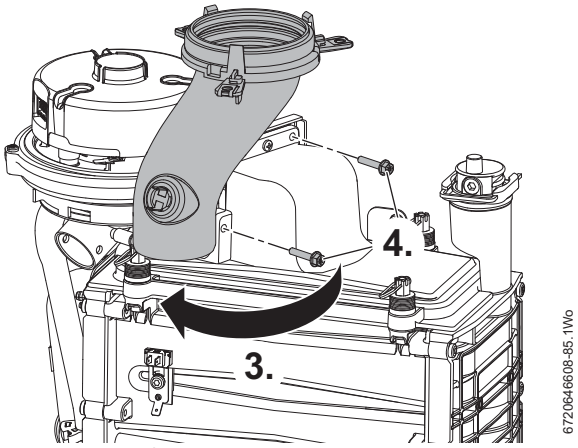


Fig. 89 Fan removal 1

5. Rotate the exhaust pipe clockwise.
6. Pull the fan assembly away from the mount, lift and rotate the fan towards you. Ensure that the front of the fan clears the left hand front castellated nut securing the burner housing.
7. Pull the gas pipe off the fan body connection, the pipe is secured by the interference fit between the pipe and connector.
8. Remove the electrical connector and earth from the fan.

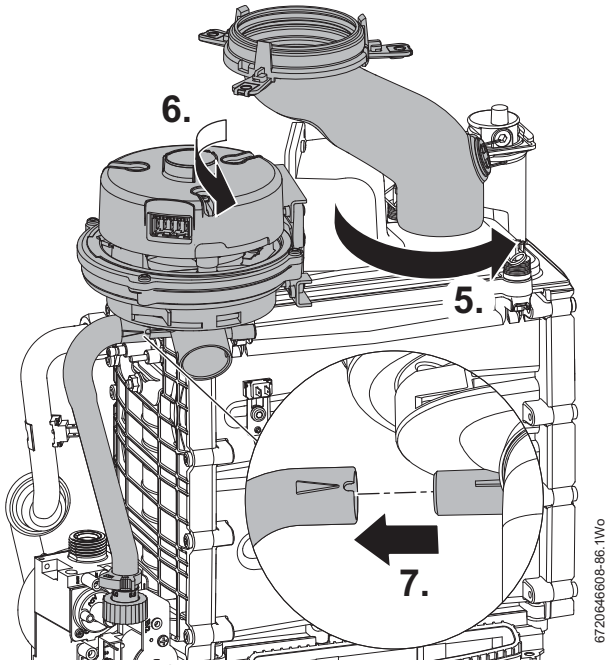


Fig. 90 Fan removal 2

6.8.10 AIR/GAS FLAP VALVE ASSEMBLY

1. Remove the single screw securing the air/gas flap valve assembly.
2. Pull the flap assembly away from the housing.

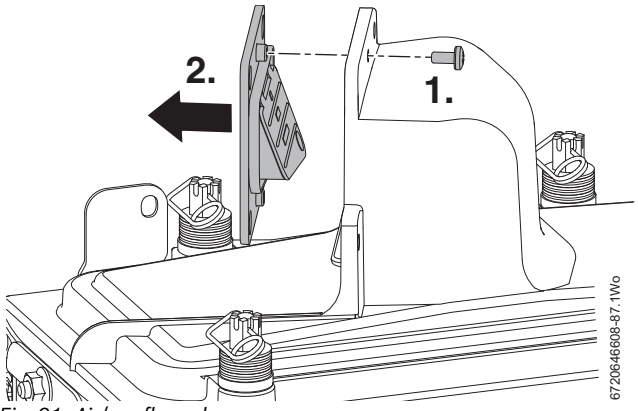


Fig. 91 Air/gas flap valve

6.8.11 IGNITION TRANSFORMER

To remove the ignition transformer

- ▶ Isolate the mains electrical supply to the boiler.
- ▶ Remove the combustion air inlet pipe.
- ▶ Ensure that the harness wires are disconnected from the transformer.
- ▶ Remove the electrode cables.
- ▶ Lift the transformer from the retaining clip.

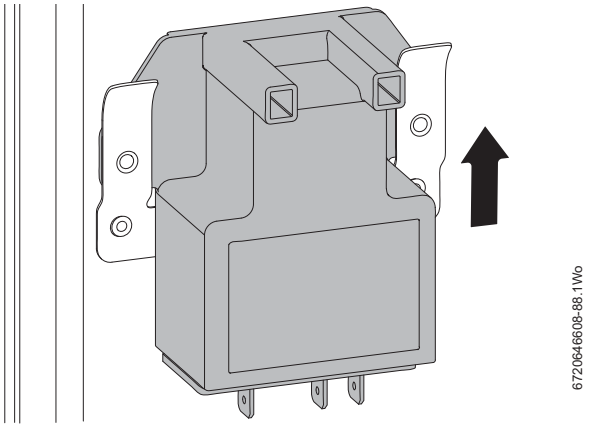


Fig. 92 Ignition transformer

6.8.12 ELECTRODE ASSEMBLY

CAUTION: Component replacement:
- ▶ After replacement of a gas related component, where a gasket or seal has been disturbed or replaced, check for gas tightness using a gas sniffer/analyser.
- ▶ Also after re-assembly, carry out the following checks: Fan pressure in section 6.5, Flue gas analysis in section 6.6.

To remove the spark electrode assembly:
1. Undo and remove the two nuts securing the electrode assembly
2. Rotate the electrode assembly down and forward to remove from the Heat exchanger.
- ▶ Inspect the spark electrodes (2), ionisation probe (3) and ceramics for signs of contamination or damage, replace as necessary.
- ▶ If necessary, clean the spark electrodes and ionisation probe with a plastic scouring pad.
- ▶ Re-assemble with a new electrode gasket (1),

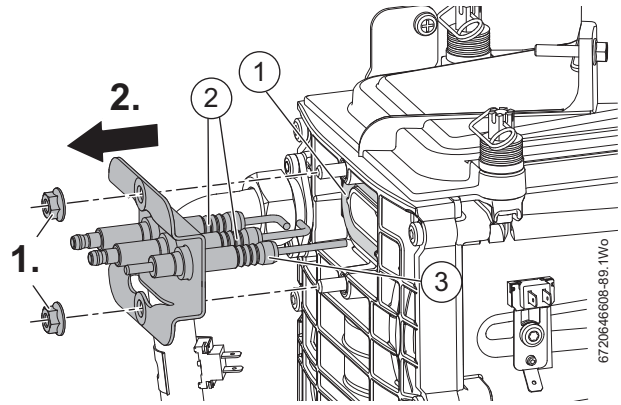


Fig. 93 Electrode assembly

6.8.13 BURNER HOUSING, BURNER/ GASKET

The front two bolts retaining the burner housing are NOT captive and will drop out when the nuts are removed.

To remove the burner housing.
1. Release and remove the four spring pins from the castellated nuts.
2. Undo the front two castellated nuts/springs and remove and retain along with the front two bolts (1).
   Slacken the two rear castellated nuts/springs, but do not remove.

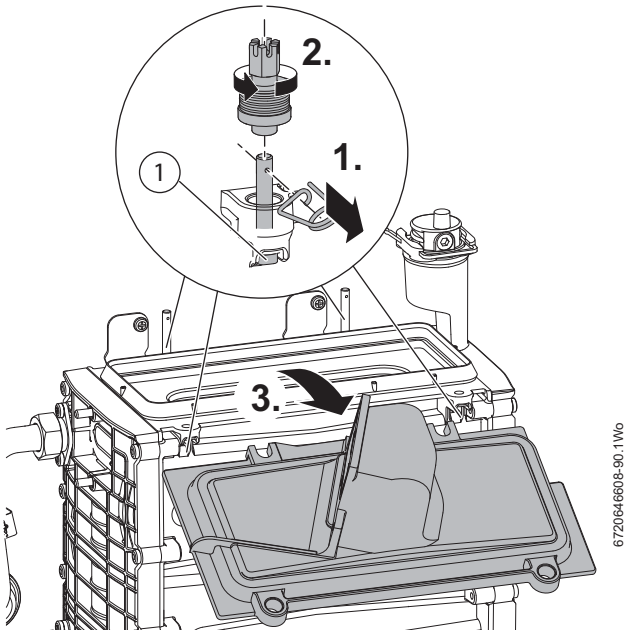


Fig. 94 Burner housing

3. Pull the burner housing up and forward to remove.

To remove the burner and gasket.
1. Lift the gasket (1) and burner mesh (2) from the heat exchanger body.
- ▶ When fitting the burner, ensure that the convex side of the burner faces down into the heat exchanger.
- ▶ Always fit a new gasket (1) when re-assembling the heat exchanger.

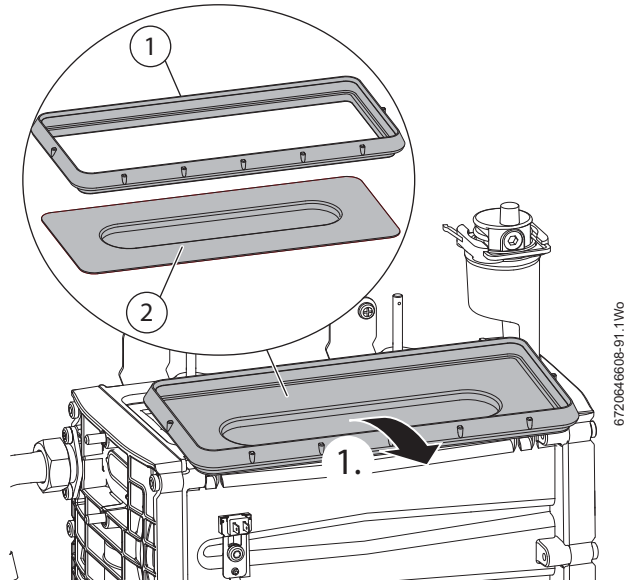


Fig. 95 Burner and gasket

TIGHTENING DOWN THE BURNER HOUSING

1. Tighten the burner housing castellated nuts [1] down gradually and evenly and in a rotating sequence.
2. Tighten the castellated nuts down until they “bottom out” on the heat cell, as indicated by the arrow on the figure below.
- ▶ Fit the spring clip [2] to secure the castellated nuts, if the hole does not line up with a space, back the nut off slightly until the hole does align with the slot.

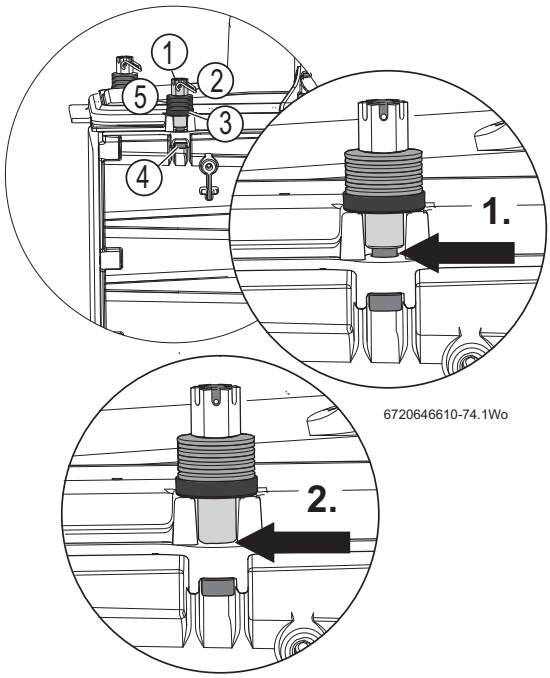


Fig. 96 Castellated nuts

[1] Castellated nut
[2] Spring clip
[3] Washer
[4] Burner housing bolts
[5] Tension springs

6.8.14 HEAT EXCHANGER

Before removal:
- ▶ Isolate the electrical power to the boiler.
- ▶ Drain the boiler.

HEAT EXCHANGER DISCONNECTION

1. Undo the flow and return connections.
2. Pull both the flow and return pipes away from the heat exchanger.

▶ Replace the fibre washers (1) when replacing the heat exchanger.

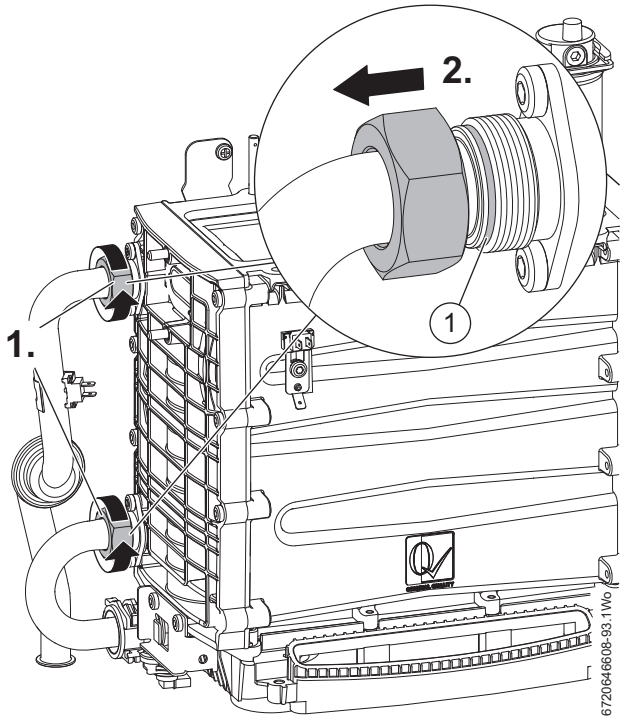


Fig. 97 Heat exchanger disconnection

HEAT EXCHANGER REMOVAL

- ▶ Ensure any electrical wires or connectors are removed.
- ▶ Remove the Auto air vent (refer to section 6.8.7) to ease removal of the heat exchanger

1. Unscrew the heat exchanger retaining nut.
2. Remove the heat exchanger retaining nut.
3. Remove the two screws securing the heat exchanger to the air box.
4. Lift the heat exchanger until the lower connection clears the hole in the air box.
5. Pull the heat exchanger towards you to remove.

CAUTION: Component replacement:
- ▶ After replacement of a gas related component, where a gasket or seal has been disturbed or replaced, check for gas tightness using a gas sniffer/analyser.
- ▶ Also after re-assembly, carry out the following checks:
  Fan pressure in section 6.5,
  Flue gas analysis in section 6.6.

▶ Re-assemble in the reverse order.

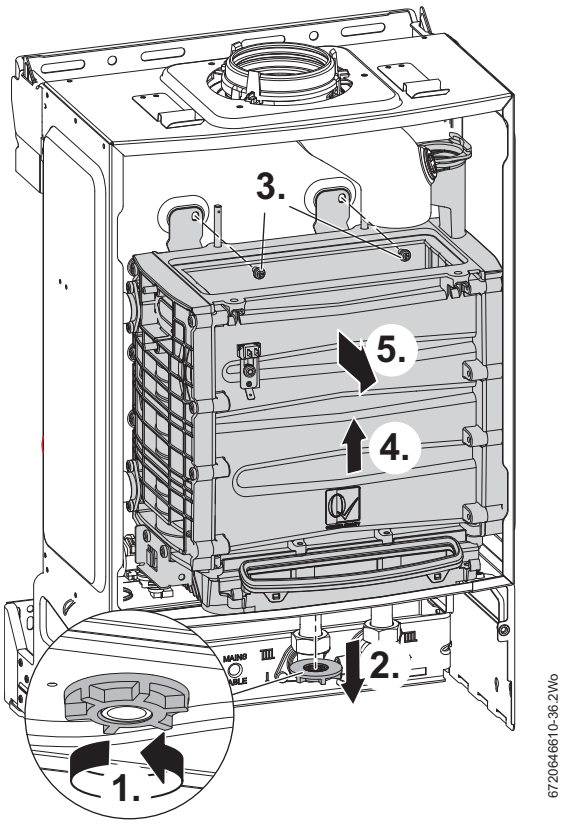


Fig. 98 Heat exchanger removal

6.8.15 BOILER RETURN SENSOR (NTC)

- ▶ Disconnect the electrical connectors from the sensor.
- ▶ Unclip the sensor from the pipe.

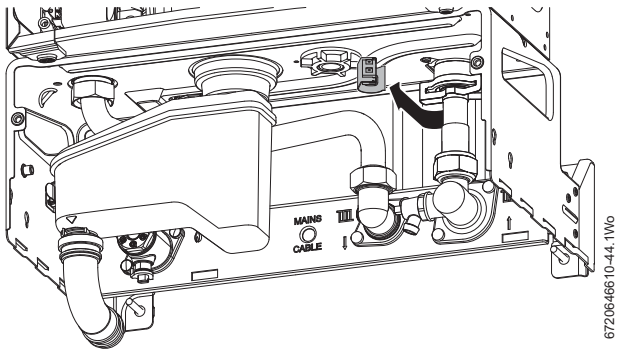


Fig. 99 Boiler return sensor

6.8.16 ACCESS TO BOILER CONTROL COMPONENTS

▶ Push in the catches and remove the bottom panel.

1. Release the two screws securing the control panel.
2. Pull down to release the two catches.
3. Pull the bottom of the control panel forward.
4. Swivel the control panel down.

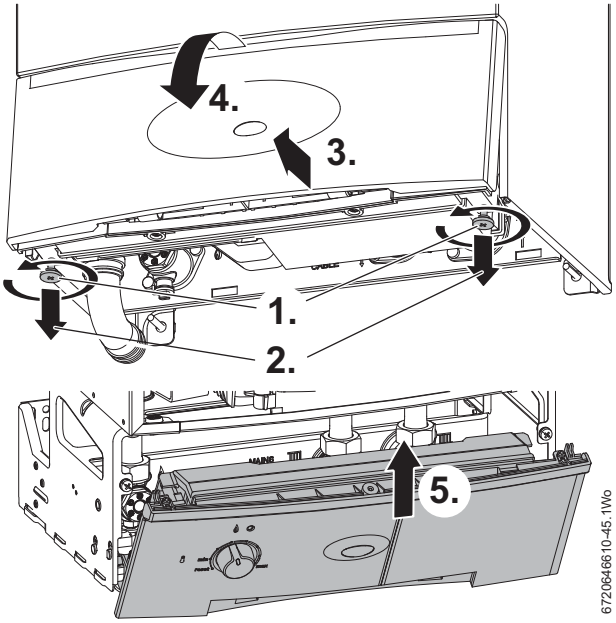


Fig. 100 Removing the control panel

1. Release the screws securing the access cover.
2. Lift the cover.
3. Pull the cover forward to remove.

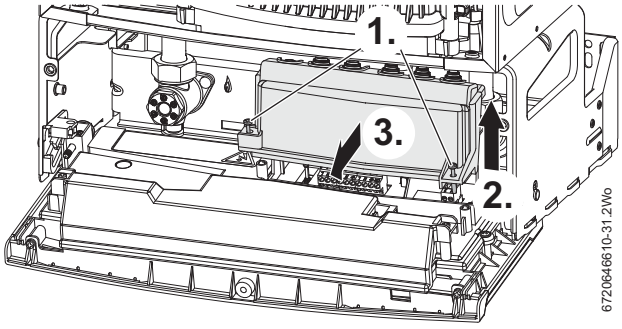


Fig. 101 Removing the installer access cover

1. Unplug the cables.
2. Pinch in the sides of the connector block to release.
3. Lift the complete connector block out.

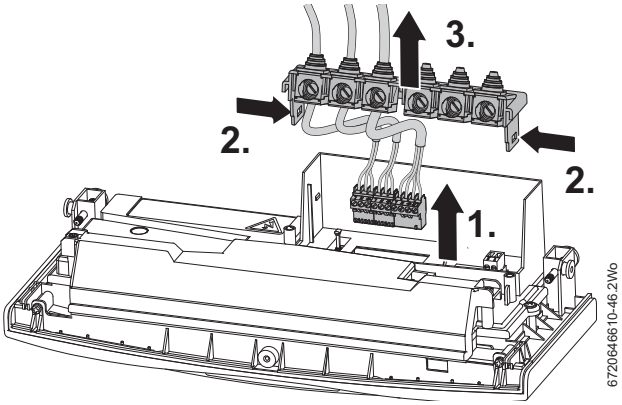


Fig. 102 Cable removal

1. Release the screws retaining the cover.
2. Lift the cover to remove.

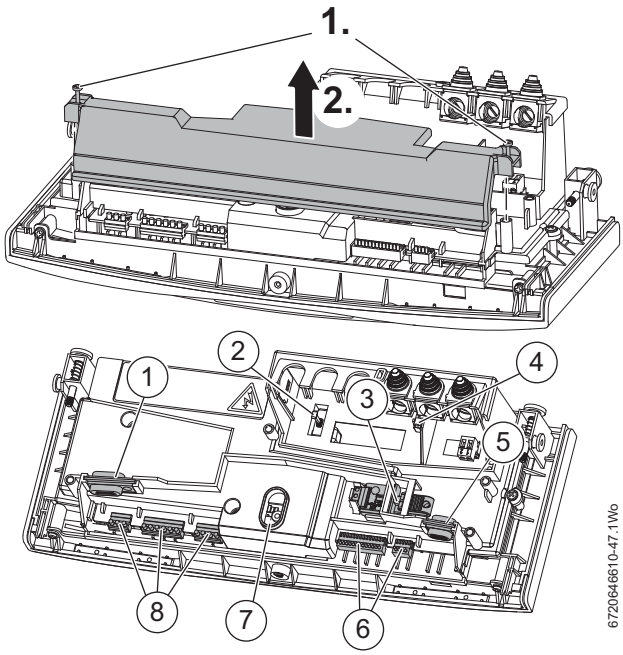


Fig. 103 Control panel detail

[1] Mains voltage cable outlet
[2] Fuse holder
[3] HCM - Heating Control Module
[4] Spare fuse
[5] Low voltage cable outlet
[6] Low voltage connectors
[7] Diagnostic port (for Worcester Bosch service engineers only)
[8] Mains voltage and earth connectors

PCB FUSE

The fuse and holder (2) are located next to the high voltage connectors and the spare fuse (7) is located on the back of the installer access cover.

To remove the fuse:

▶ Pull the fuse holder (2) up.
▶ Replace the fuse and re-insert the fuse holder.

6.8.17 REPLACING THE HEATING CONTROL MODULE (HCM)

▶ Press down on the retaining clip on the module and slide out from the cover.
▶ Disconnect the HCM from the connector.
▶ Connect the new HCM and slide back into the retainer until the module is secure.

6.8.18 REPLACING THE CONTROL UNIT

The control unit is supplied complete in the plastic housing. The complete unit must be replaced.

▶ Reconnect the boiler cable edge connectors to the board.
▶ Reconnect the cables removed earlier in to the 230V connector block.
▶ Replace the covers removed earlier.
▶ Hold the control panel at approximately 60° to the horizontal and re-engage the panel with the hinges.
▶ Re-attach the support strap to the new control unit.

6.9 SHORT PARTS LIST

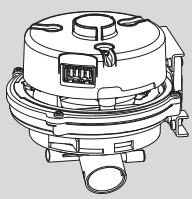
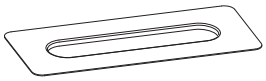
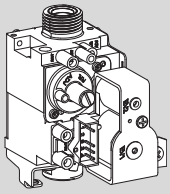
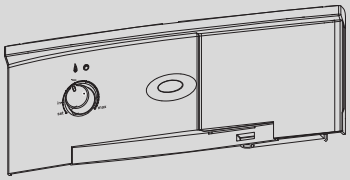
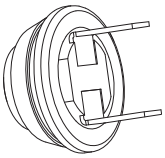
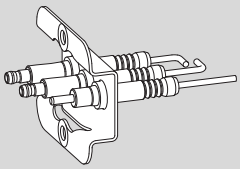
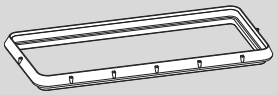
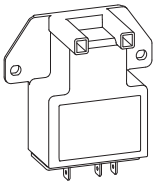
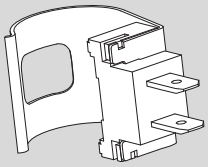
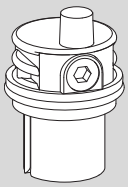
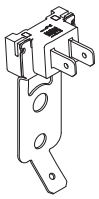
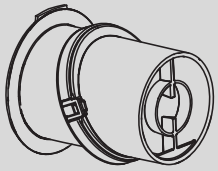
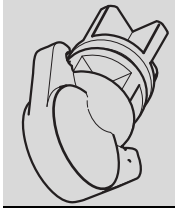
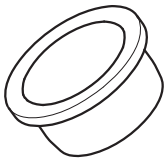
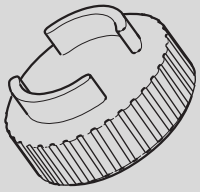
 Fan 7 746 009 09A 0	 Burner 8 718 600 23B 0	 Gas Valve 8 718 600 04A 0
 Control panel 8 718 682 010 0	 Flue overheat thermostat (grommet type) 8 717 206 213 0	 Electrodes (including gasket) 8 718 600 28A 0
 Burner seal 8 718 600 24A 0	 Spark generator 8 718 688 015 0	 Flow NTC 8 718 688 801 0
 Auto Air Vent T 005 000 87A 0	 Maximum safety sensor NTC 8 718 685 483 0	 Flue terminal end 8 718 681 828 0
 Flue sample plug - vertical adapter 8 710 506 199 0	 Flue sample plug - air intake 8 716 11 253 0	 Flue sample plug - gas outlet 8 716 111 252 0

Table 12 Short parts list

7 FAULT FINDING AND DIAGNOSIS

7.1 FAULT FINDING

This fault finding information is for guidance only. Worcester cannot be held responsible for costs incurred by persons not deemed to be competent.

The electronic control system for this boiler incorporates a blue light on the front fascia. This light indicates normal operation, but by flashing at different rates during a fault, provides a guide to the cause as listed.

Faults that might develop with this boiler are either Blocking or Locking faults:
Blocking faults will stop the boiler operating, once the fault is cleared the boiler will restart automatically. This may mean waiting for the boiler to cool down or waiting for a pre-defined time period.

Locking faults require manual intervention, for example pressing the Reset button on the boiler fascia.

This fault finding system assumes that the appliance has been operating normally until the time of failure (i.e. not a first installation error).

PRELIMINARY CHECKS: Preliminary electrical system checks are the first electrical checks to be carried out during a fault-finding procedure.

On completion of the Service/Fault-Finding task which has required the breaking and remaking of electrical connections, check:
(a) EARTH CONTINUITY,
(b) SHORT CIRCUIT CHECK,
(c) POLARITY and
(d) RESISTANCE TO EARTH.

FLASHING FAULT CODES

The flashing sequences will be split into three groups:

1. A five second “off” period (A), followed by a count of either 1,2,3,4 or 5 flashes (B), at a rate of 1 second on and 1 second off.
2. A five second “off” period (A), followed by 4 fast flashes (C), lasting 2 seconds, followed by a count of either 1,2,3,4 or 5 flashes (B), at a rate of 1 second on and 1 second off.
3. A five second “off” period (A), followed by a count of either 1,2,3,4 or 5 flashes (B), at a rate of 1 second on and 1 second off followed by 4 fast flashes (C), lasting 2 seconds.

In all cases the sequences will be continually repeated after the 5 second “off” period.

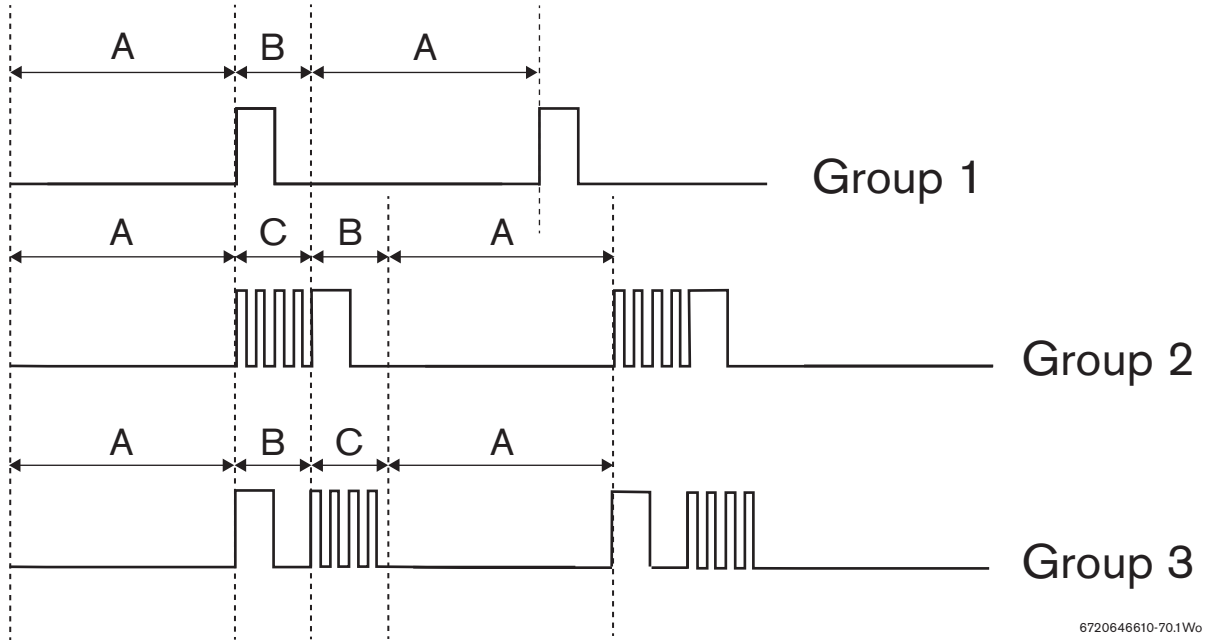


Fig. 104 Fault flash timing

[A] 5 second off period
[B] period with 1 to 5 flashes
[C] 2 second period with 4 fast flashes

7.1.1 GROUP 1 FAULT CODES

Flash sequence	Type of fault	Fault	Possible solutions/check
Light OFF		No fault	No boiler demand - boiler is OK
Light ON			Heating demand on boiler- boiler is OK
Group 1 Flashing codes			
1	Locking	No ionisation detection after ignition	Failure of four ignition attempts, the boiler waits 30 seconds before another attempt is made. Reset the boiler by turning the control knob anti-clockwise to the reset position.
2	Locking	Loss of ionisation signal during operation	An established flame has been extinguished. Reset the boiler by turning the control knob anti-clockwise to the reset position.
3	Locking	Gas valve error	Gas valve coil disconnected. Check gas valve. Reset the boiler by turning the control knob anti-clockwise to the reset position.
4	Locking	First safety timing error/ignition timing error	The flame was not established during the first four seconds of the ignition period. Reset the boiler by turning the control knob anti-clockwise to the reset position.
5	Locking	Ionisation detected after burner stopped Gas valve EV2 leak test failed Gas valve EV1 leak test failed Ionisation current detected before burner-start Gas valve error Ionisation sensor shorted	Gas valve leaking. False flame detected. Reset the boiler by turning the control knob anti-clockwise to the reset position.

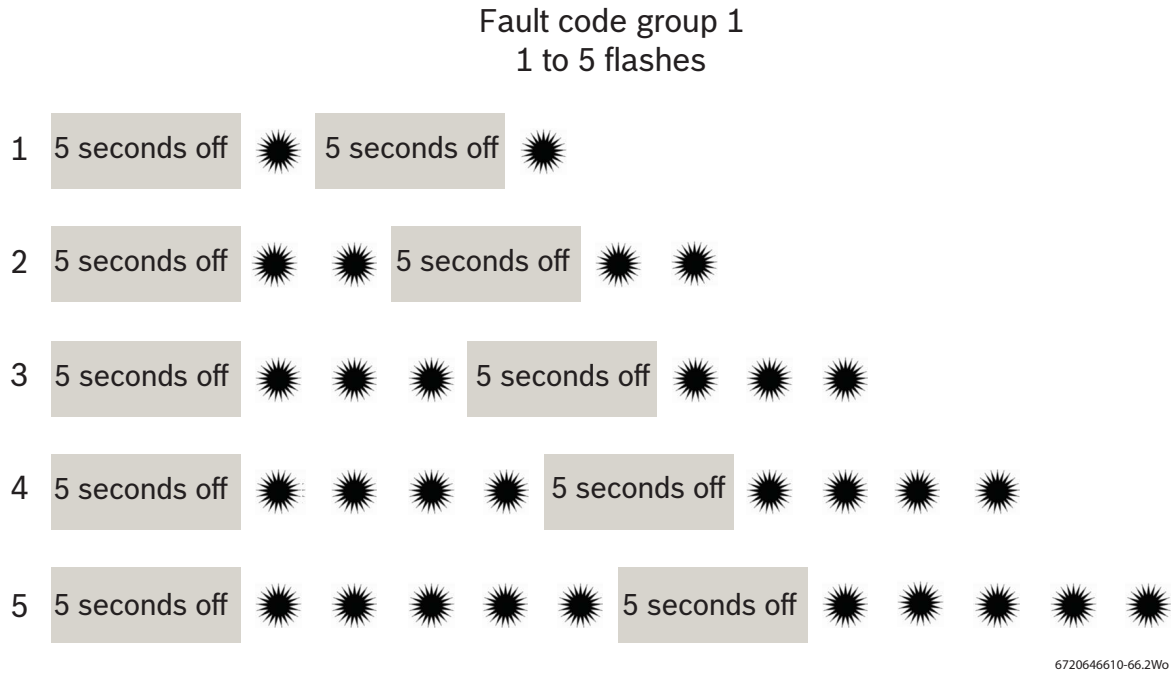


Fig. 105 Group 1 flash sequences

7.1.2 GROUP 2 FAULT CODES

Flash sequence	Type of fault	Fault	Possible solutions/check
Light OFF			No boiler demand - boiler is OK
Light ON			Heating demand on boiler- boiler is OK
Group 2 Flashing codes			
6	Locking	Sensor test failed	On power up all safety sensors are checked, the check failed. Reset the boiler by turning the control knob anti-clockwise to the reset position.
7	Locking	Safety temperature too high	The main heat exchanger has overheated. Maximum temperature 105°C. Reset the boiler by turning the control knob anti-clockwise to the reset position.
8	Blocking	MAX safety thermostat activated	Flue gas thermostat overheat
9	Locking	Return temperature too high	Boiler overheat. Reset the boiler by turning the control knob anti-clockwise to the reset position.
10	Locking	Flow temperature too high - Supply sensor exceeded 110°C	Primary flow sensor overheated. Reset the boiler by turning the control knob anti-clockwise to the reset position.

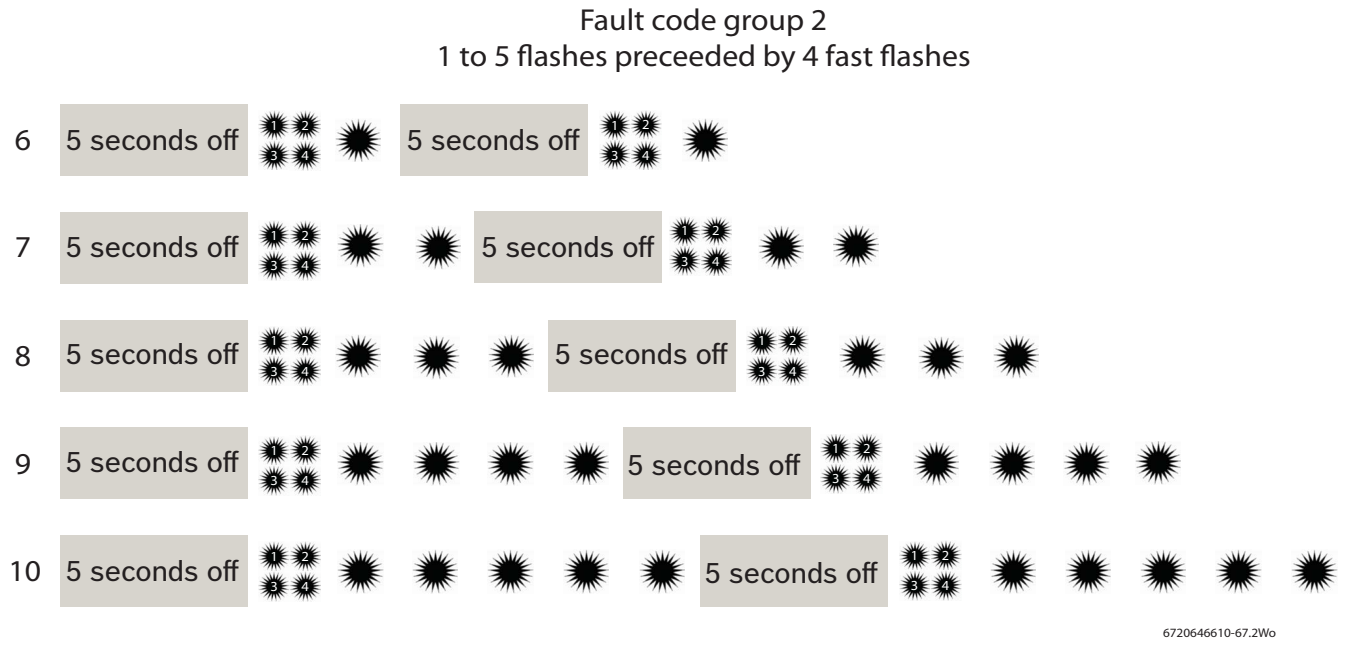


Fig. 106 Group 2 flash sequences

7.1.3 GROUP 3 FAULT CODES

Flash sequence	Type of fault	Fault	Possible solutions/check
Light OFF			No boiler demand - boiler is OK
Light ON			Heating demand on boiler- boiler is OK
Group 3 Flashing codes			
11	Locking	HCM (Heat Control Module) Defective	Incorrect, faulty, or missing HCM. Replace HCM with correct item Reset the boiler by turning the control knob anti-clockwise to the reset position.
12	Locking	Fan running too fast Fan running too slow No airflow after defined period of time Fan not running	Defective fan or blocked air way. Reset the boiler by turning the control knob anti-clockwise to the reset position.
13	Locking	Mains voltage interrupted after locking error	Reset the boiler by turning the control knob anti-clockwise to the reset position.
14	Locking	Internal control board faults	Call Worcester, Bosch Group technical help-line 0330 123 3366
15	Locking	All other faults	Miscellaneous Reset the boiler by turning the control knob anti-clockwise to the reset position.

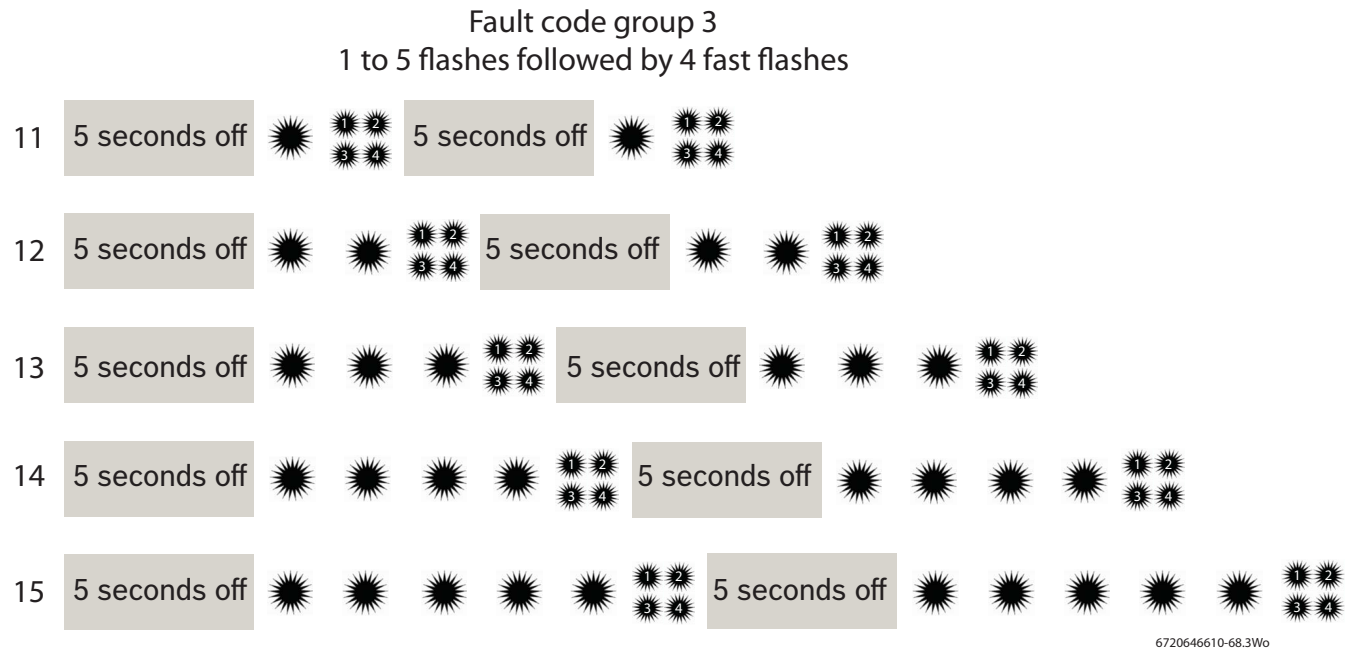
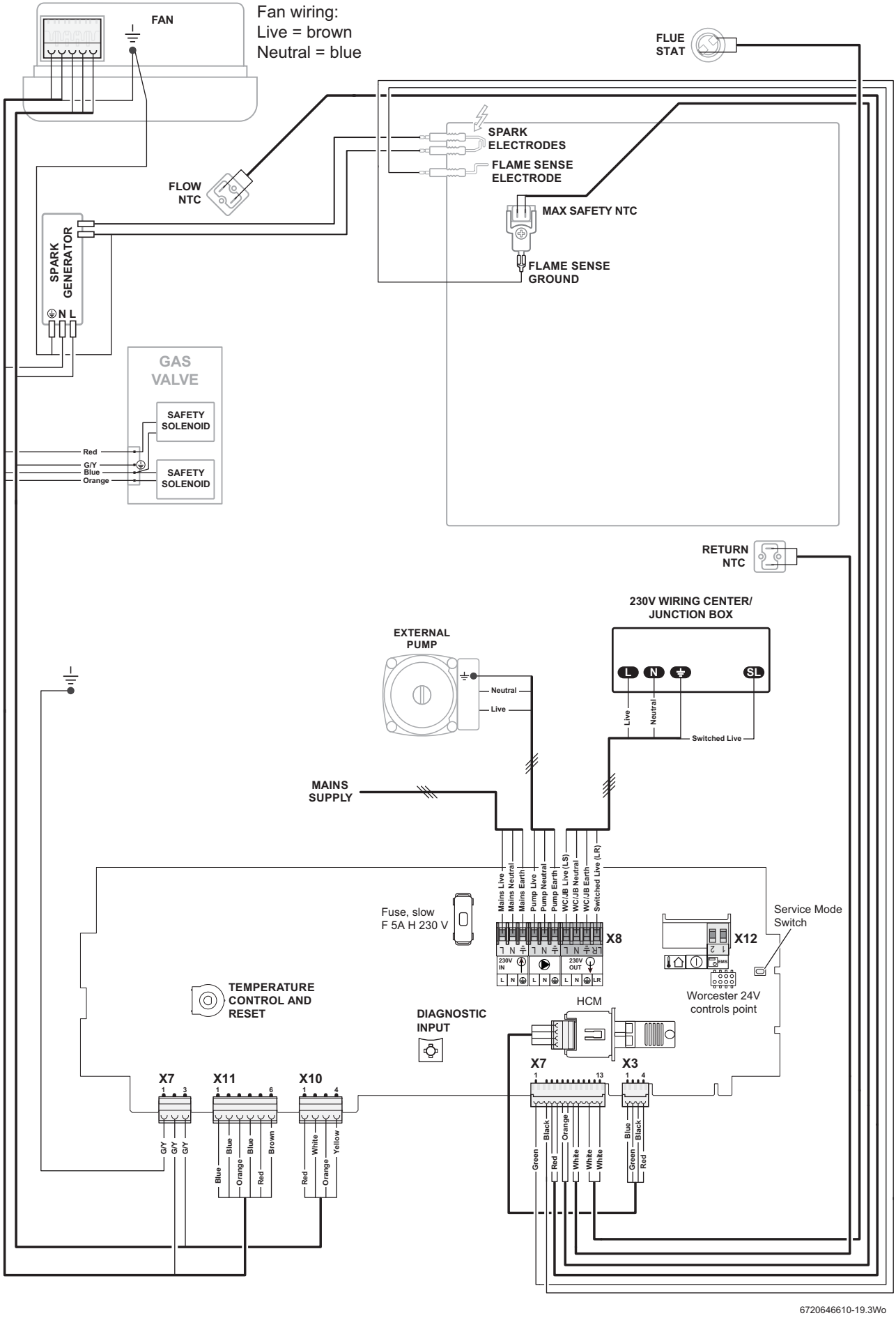


Fig. 107 Group 3 flash sequences

7.2 WIRING DIAGRAM



7.3 BOILER FUNCTION

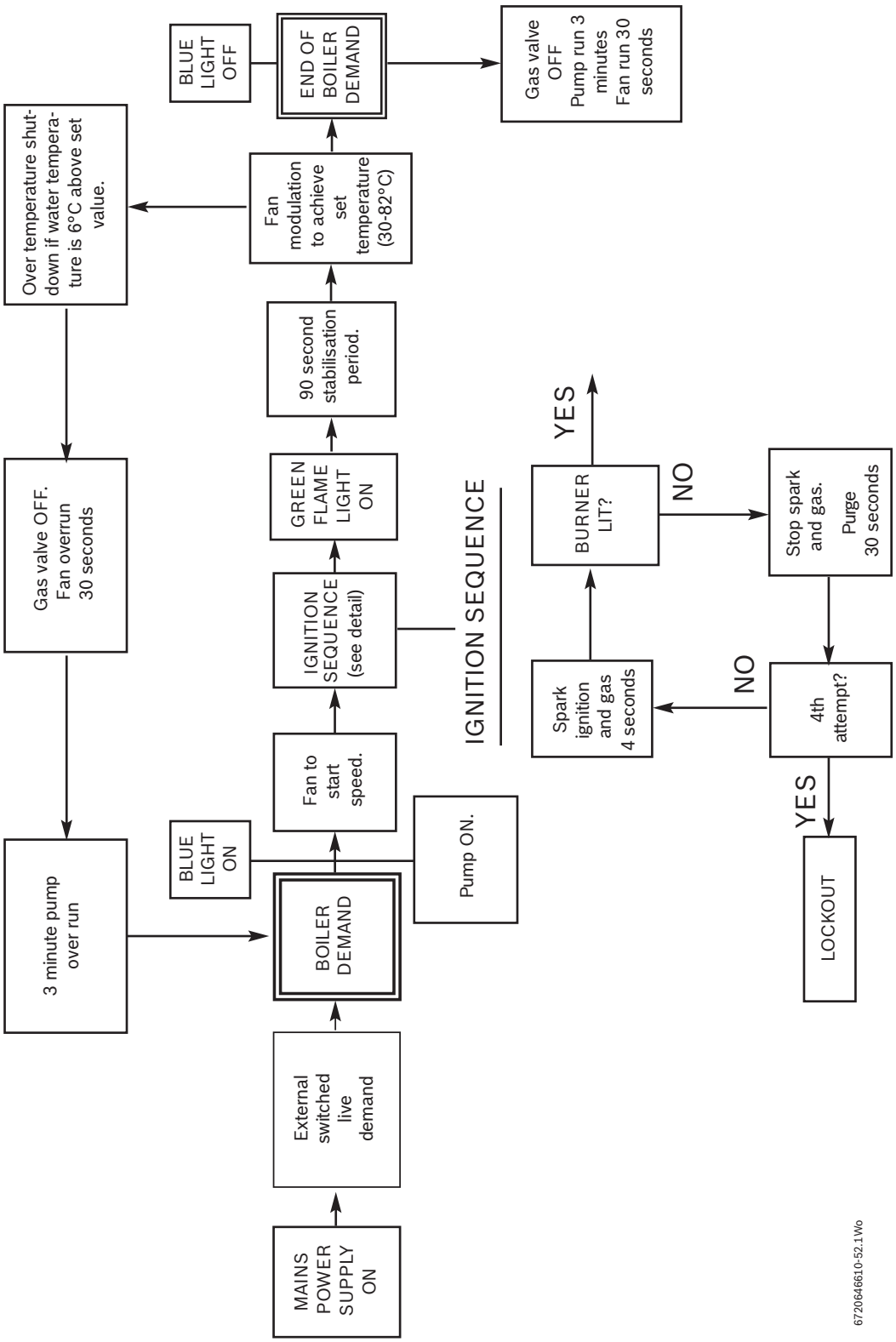
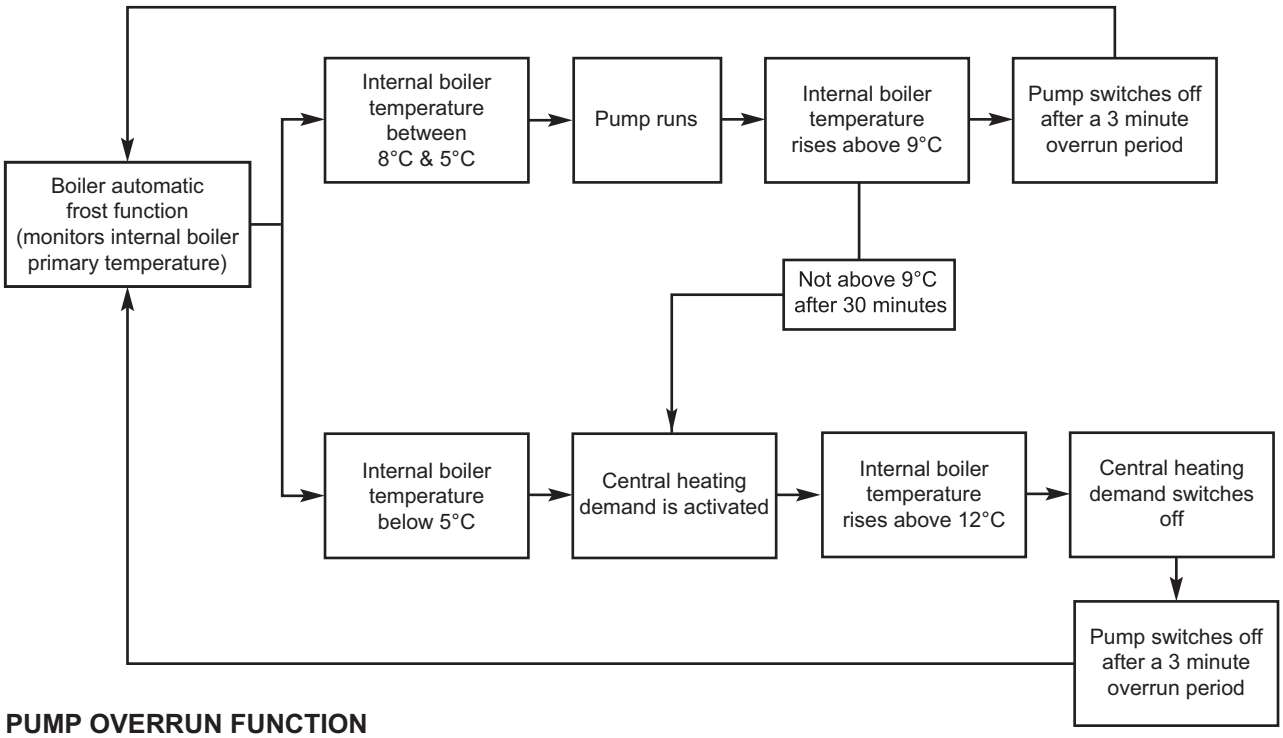


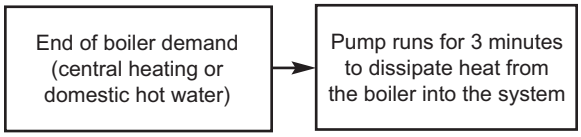
Fig. 108

7.4 PROTECTION FUNCTION

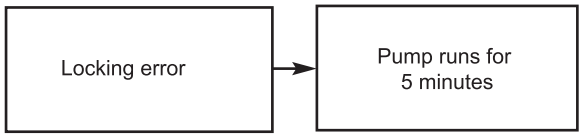
AUTOMATIC INTERNAL FROST FUNCTION



PUMP OVERRUN FUNCTION



PUMP OVERRUN LOCKING ERROR



PUMP ANTISEIZE FUNCTION

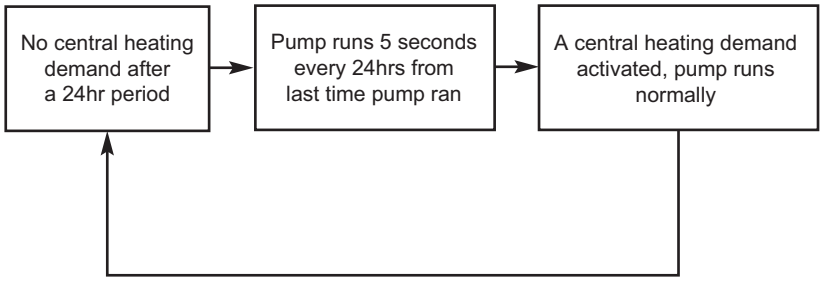


Fig. 109

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.

benchmark COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

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.

benchmark COLLECTIVE MARK
THE MARK OF QUALITY FOR THE INSTALLATION, COMMISSIONING AND SERVICING OF DOMESTIC HEATING AND HOT WATER SYSTEMS

WORCESTER, BOSCH GROUP:

TECHNICAL SUPPORT:	0330 123 3366
APPOINTMENTS:	0330 123 9339
SPARES:	0330 123 9779
LITERATURE:	0330 123 9119
TRAINING:	0330 123 0166
SALES:	0330 123 9669

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Cotswold Way, Warndon, Worcester WR4 9SW.
Tel. 0330 123 9559
Worcester, Bosch Group is a brand name of Bosch Thermotechnology Ltd.
worcester-bosch.co.uk

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Bosch Group