The **Greenstar Highflow 440** gas-fired condensing combi boiler

Technical and specification information

CORGI Award winner 2005, 2006 & 2007

WORCESTER
Bosch Group

Worcester, Bosch Group headquarters

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Working together for many years, heating professionals and Worcester have been making a real difference in hundreds of thousands of homes across the UK. We are recognised as a market leader in high efficiency, condensing boiler technology and are also committed to providing renewable energy solutions.

As part of the Bosch Group, our products are designed and manufactured to provide the high levels of quality and reliability which are synonymous with the Bosch name throughout the world.

We're a leading British company, employing more than 2,000 people at our headquarters and manufacturing plants in Worcester and at Clay Cross in Derbyshire, including a nationwide network of over 300 Service Engineers and over 60 technically-trained Field Sales Managers.

As part of Europe's largest supplier of heating products, Worcester, Bosch Group has the UK-based resources and support capability to offer you the value-added solutions we feel you deserve.

"At Worcester we recognise the vital role you, our customer, has in the specification and installation of 'A' rated, energy efficient appliances in homes across the UK. We will continue to invest in our products, people, facilities and added value services such as training, to give you the support you require in providing a total solution for your customers' comfort."

Richard Soper,
Managing Director, Worcester, Bosch Group

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Aluminium/silicon sand cast inner of WB5 heatcell.

The Greenstar Highflow 440 condensing combi boiler

The Greenstar Highflow 440 is a market leading energy-saving floor standing combi which is very good news for the environment and excellent news for specifiers, developers, installers and consumers alike.

The Greenstar Highflow 440 condensing boiler has an average annual efficiency (SEDBUK value) of 91%, efficiently producing heat for your heating and hot water. Standard efficiency boilers achieve around 78% efficiency. Therefore, a Greenstar Highflow 440 can cut heating and hot water bills and it's cheaper to run than an older boiler. Hence SEDBUK Band A rating for the new Greenstar Highflow 440.

The Greenstar Highflow 440 condensing boiler delivers this energy-saving performance by ingeniously recycling exhaust gases to extract and re-use the latent heat – a highly efficient use of energy which also significantly reduces the yearly carbon dioxide emissions into the atmosphere.

And to all these major benefits you can add yet more: superlative Worcester quality and reliability; outputs and flow rates to comfortably satisfy the heating and hot water demands of the larger household with more than one bathroom; and truly exceptional all-round value for money.

The Greenstar Highflow 440 combi at a glance

		Greenstar Highflow 440
Output kW to DHW	**Min**	7.5kW
	Max	29.2kW
Flow rate at 35ºC Δ T		20l/min
CH temperature control		•
DHW temperature control		•
Modulating control		•
Natural gas		•
LPG boiler		Conversion kit available
Electronic ignition		•
SEDBUK band		A (91.0%)

Features	Benefits
20 litre/minute flow rate	Suitable for larger family homes
Temperature control for CH + DHW	Consumer-friendly and energy saving
Filling link supplied	Labour and money saving
Optional plug-in twin channel programmer	No electrician required
Built-in condensate pump	Increases siting possibilities
Floor mounted pre-plumbing jig	Allows pre-fabrication of system
Roll-in boiler tray	Minimises risk of damaging floors
Multi-directional Condensfit Highflow fluing	Siting flexibility
Electronic ignition	Energy saving
Built-in frost protection	Money saving, economical protection
Pump seizure protection	Prevents call-backs
Fault finding diagnostics	Time saving
Modulation control	Energy saving
Anti-cycle device	Energy saving
No ventilation grilles required in compartments	Labour and money saving

The Greenstar Highflow 440 condensing combi boiler

A condensing boiler is more efficient due to its ability to extract more heat from the flue gases normally lost to the environment through the flue system.

The Greenstar Highflow 440 uses a proven aluminium-silicon heat cell with an extra large surface area.

As the flue gases pass through the heat exchanger this extra surface area cools the flue gases to around 55°C whereupon the latent heat within is released and applied to the system. This is heat that would normally be lost to the atmosphere.

It is this ability to extract as much heat as possible from the gas it burns that gives the Greenstar Highflow 440 an exceptionally high level of operating efficiency.

This higher efficiency is recognised within section L of the Building Regulations, subsequently achieving a higher SAP or NHER rating.

The separate plated DHW heat exchanger combined with the thermal store ensures that hot water is delivered instantly to the outlet being operated.

Modulating central heating and hot water outputs combined with separate consumer controls, also mean that comfortable temperature levels for both can be set independently of each other.

The Greenstar Highflow 440 is supplied as standard suitable for sealed primary water systems. The appliance contains a 12 litre expansion vessel, 3bar pressure relief valve, pressure gauge and an automatic air vent. The appliance cannot be used on an open vent system.

Fluing

The Greenstar Highflow 440 is available as a multi-directional room-sealed fanned flue appliance.

Gas

The appliance is available in natural gas and may be converted to Liquid Petroleum Gas (LPG) using a conversion kit.

The advantages of a combi boiler

A combi (or combination boiler) is a compact and highly efficient unit giving all the heating and hot water you need, with significant savings on running and installation costs.

Unlike a conventional heating and hot water system, a combi boiler system does not store domestic hot water. It heats water directly from the cold water mains – as you use it. There's no hot water cylinder, no tank in the loft (and so less risk of freezing and flooding), and none of the connecting pipework.

So you not only save space, but also reduce hot water costs – which can account for up to 60% of a typical domestic fuel bill.

A combi also supplies hot water at mains pressure, giving you exhilarating power showering without the need for a pump. And as, on average, a shower uses considerably less water than a typical bath, the savings on hot water costs and water consumption can be significant.

Regular boiler layout

Combi boiler layout

Operation

Hot water mode

With the appliance in a standby condition, i.e. thermal store or heatbank at temperature set by the hot water thermostat, a demand for hot water will cause the flow turbine to energise the pump and circulate primary hot water around the boiler and the plated water to water heat exchanger. The burner will ramp-up at its maximum setting and modulate accordingly to maintain the temperature of the heatbank.

When hot water is no longer required the appliance will continue to operate until the heatbank has returned to the required temperature.

Priority is always given to the production of domestic hot water. Should the central heating be in operation when a hot water demand is made, the supply to the radiators will be temporarily interrupted.

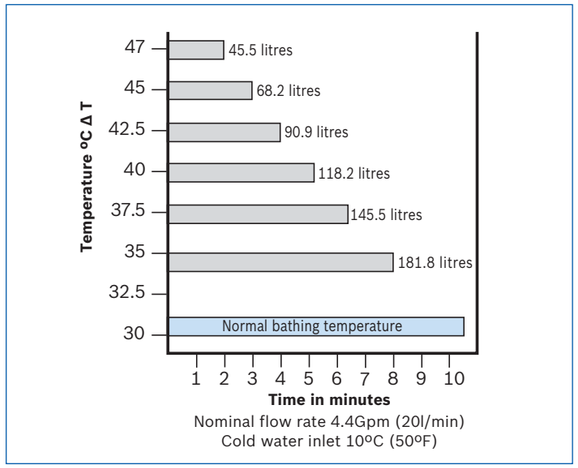
Central heating mode

On a demand for central heating the pump will energise, the diverter valve will open and primary water will circulate around the heating system. The burner will light at the minimum setting and ramp upwards to meet the system demand. The radiators will heat up to the temperature set by the fascia mounted heating temperature controller.

Application of Greenstar Highflow 440

- The Worcester Greenstar Highflow 440 delivers domestic hot water at a flow rate of 20 litres/min (4.4gpm), making the appliance ideally suited for use in medium to large sized family homes, incorporating up to two bathrooms
- As the Worcester Greenstar Highflow 440 delivers hot water at mains pressure, it is ideally suited to providing a powerful shower
- The Worcester Greenstar Highflow 440 can be sited where space and water storage is a problem
- The Worcester Greenstar Highflow 440 may be used to provide domestic hot water only, with radiators being added at a later date
- The fluing options available with the Greenstar Highflow 440, both horizontal and vertical, offer excellent scope for siting the appliance, particularly in kitchens, airing cupboards, etc
- The Worcester Greenstar Highflow 440 can be sited underneath a worktop as servicing can be undertaken from the front. A removable section of worktop is recommended should you require top access for maintenance work.

Hot water performance



Nominal flow rate 4.4Gpm (20l/min)
Cold water inlet 10°C (50°F)

Options

Fluing

The Greenstar Highflow 440 features 2 different sizes of multi-directional RSF flue systems, 100mm or 125mm dia.

The flue can be run horizontally or vertically with additional 90° or 45° in-line bends allowing changes of route or direction, providing an extremely flexible and versatile fluing system enabling the appliance to be sited virtually anywhere.

Optional plug-in controls

The Greenstar Highflow floor standing condensing combi boiler is available with a range of easy-to-use controls. These fascia-mounted controls offer simple plug-in connection to the boiler circuit board.

Twin channel timer
The twin channel digital timer simply plugs into a pre-prepared socket on the control board thus eliminating the need for an electrician.

The simple-to-operate digital timer features:
- 24 hour timer
- 2 timed periods per day
- Dedicated advance button for each channel.

Night set-back module (TR212E)

Optimising room temperature controller (TR2)
For optimum comfort levels an optimising temperature controller (TR2) is available.

The night set-back module (TR212E) plugs into the pre-prepared socket on the control board whilst the optimising temperature controller (TR2) is sited within the property and wired back to the boiler with low voltage connections.

TR2 controller

The variable internal temperature controller monitors the room temperature and modulates the boiler output accordingly thus keeping the boiler output to the bare minimum whilst still achieving the desired room temperatures.

The temperature controller also monitors the thermal characteristics of the dwelling bringing the boiler on at the appropriate time to ensure the required room temperatures are achieved at the desired times.

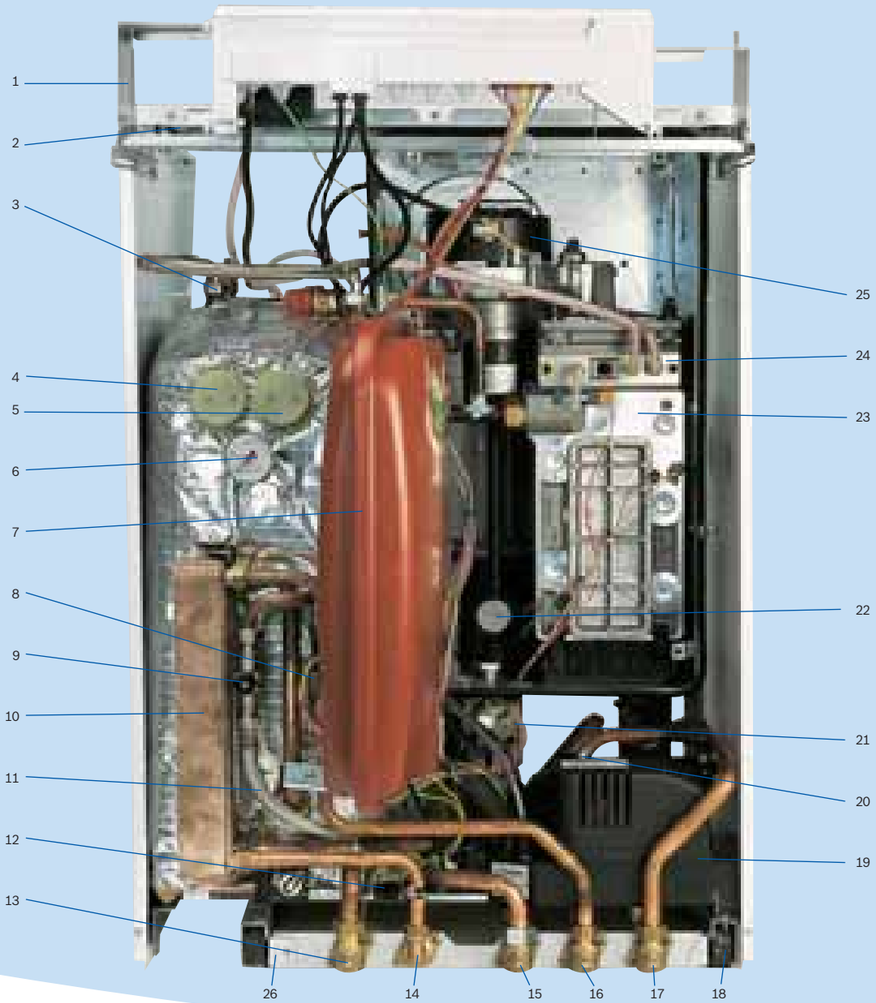
Increased SAP ratings

As well as the Greenstar Highflow 440 achieving very high SAP ratings for dwellings, the addition of the optimising temperature controller further increases these ratings as well as being part of the recommended best practice, as covered by the CHeSS design standard.

Technical data – Greenstar Highflow 440

Model	Greenstar Highflow 440
Height (mm)	850
Width (mm)	600
Depth (mm)	600
Weight – dry (kg)	112
SEDBUK value % / band – natural gas	91%/Band A
SEDBUK value % / band – LPG	92.2%/Band A
Heating flow / return connections	22mm compression
Hot / cold water connections	15mm compression
Pressure relief valve (mm dia.)	15
Condensate connection	22mm plastic pipe
Gas connection	22mm compression
Primary water content (litres)	51
Min. domestic inlet pressure for max. DHW flow rate (bar)	1.5
Min. domestic inlet pressure to operate the appliance (bar)	0.5
Max. domestic inlet pressure (bar)	10
DHW flow rate @ 35ºCΔT (l/min)	20
Output to central heating kW (Btu)	7.5 - 29.2 (25,590 - 99,630)
Floor mounted pre-plumbing jig	•
Filling link	•
Plug-in timer	• (optional)
Night set-back module	• (optional)
Optimising room temperature controller	• (optional)
Condensate disposal pump	•
Fault diagnostic display	Digital
Max. vertical flue (mm) (100mm dia.) inc. terminal	6,400
Max. vertical flue (mm) (125mm dia.) inc. terminal	15,000
Max. horizontal flue (mm) (100mm dia.)	4,000
Max. horizontal flue (mm) (125mm dia.)	13,000
NOx classification	Class 5

The Greenstar Highflow 440 condensing combi boiler – inside story



Key to components

1. Controls Support Frame
2. Bosch Heatronic Series Control Board
3. Auto-air Vent
4. Tank Overheat Thermostat
5. Tank Temperature Sensor
6. Pressure Gauge
7. Expansion Vessel
8. Water Flow Sensor Turbine
9. Filling Link Isolation Valve
10. Domestic Hot Water Heat Exchanger
11. Filling Link Flexible Pipe (not to be left attached after re-filling the system)
12. Domestic Hot Water Flow Sensor
13. Central Heating Flow Valve
14. Domestic Hot Water Outlet
15. Gas Isolation Valve
16. Mains Water Inlet Isolation Valve
17. Central Heating Return Isolation Valve
18. Runner Wheel
19. Condensate Pump Assembly
20. Diverter Valve
21. Gas Valve
22. Air/Gas Adjustment Screw (concealed)
23. Heat Exchanger
24. Gas Burner
25. Combustion Air Fan
26. Floor Mounting Pre-Plumbing Pipework Jig (provided)

Installing the Greenstar Highflow 440

Siting of appliance

General

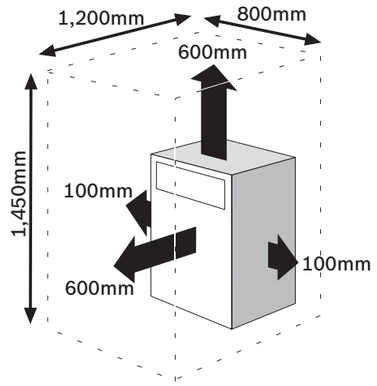
The appliance is not suitable for external installation. The floor on which the boiler is to be mounted should be capable of supporting and overall weight of approximately 160kg.

Clearances

The following clearances should be allowed for installation and servicing.

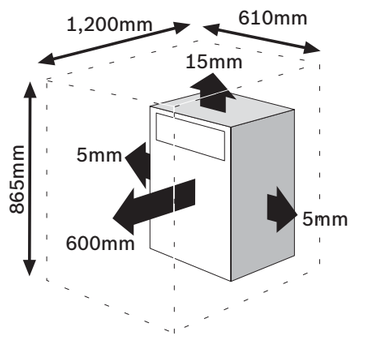
Installation clearances

The minimum space required to install the boiler only.



Service clearances

The minimum space required to service the boiler only.

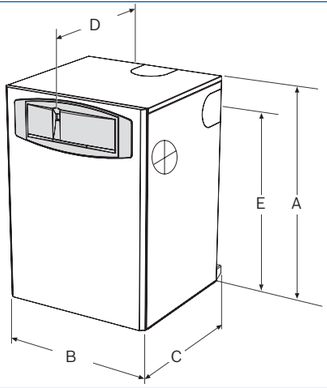


Site preparation/portability

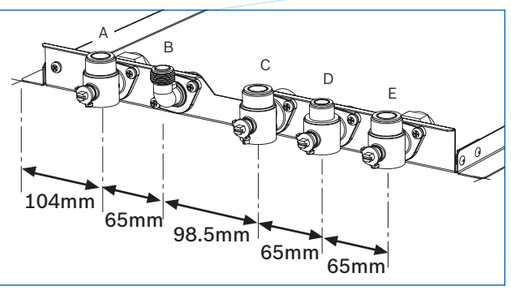
The Greenstar Highflow 440 appliance is supplied with a floor mounted pre-plumbing jig. The jig enables all gas and water services to be pre-plumbed and tested prior to fitting the boiler.

For ease of installation the appliance has a roll-in boiler tray which allows it to be rolled into place once the connections have been made.

Pipework connections and casing dimensions



Cabinet dimensions (mm)	
A	850
B	600
C	600
D	625
E	735



Pipework connections		
A	CH flow	22mm
B	DHW flow	15mm
C	Gas inlet	22mm
D	Cold main inlet	15mm
E	CH return	22mm

Condensate disposal

All condensing boilers generate condensate discharge which needs to be piped away from the appliance in a plastic pipe.

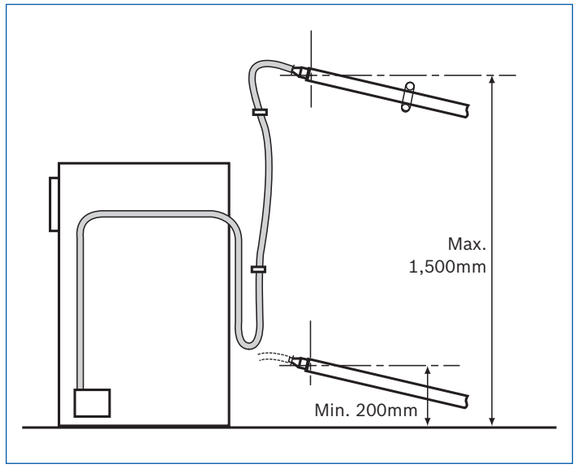
The amount of condensate generated depends on the efficiency and operating status of the appliance. Depending on operating temperatures, the appliance will condense in both heating and hot water modes and may generate up to 2.5 litres of condensate per hour.

Condensate termination and route

The Greenstar Highflow 440 incorporates a condensate pump which allows condensate to be plumbed above the boiler, allowing more flexible siting possibilities.

Condensate connection

The condensate pump fills up and periodically discharges through the flexible condensate pipe between 200mm and 1,500mm from floor level. After this point the condensate continues down the 22mm rigid pipework to the outlet using gravity.



- The flexible plastic pipe can be reduced in length to suit the installation circumstances. The pipework must follow one of the options shown opposite.

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

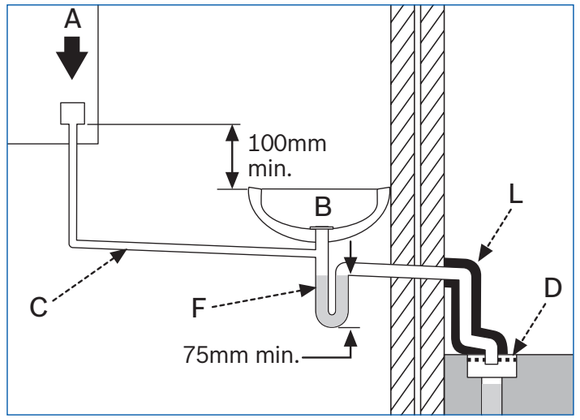
Note: any external condensate pipework should be protected with weather resistant insulation to help prevent freezing.

The condensate connection on Worcester appliances is in 22mm polypropylene. The pipe should be extended and run away from the appliance with a constant fall of 3º or 50mm in every metre away from the boiler.

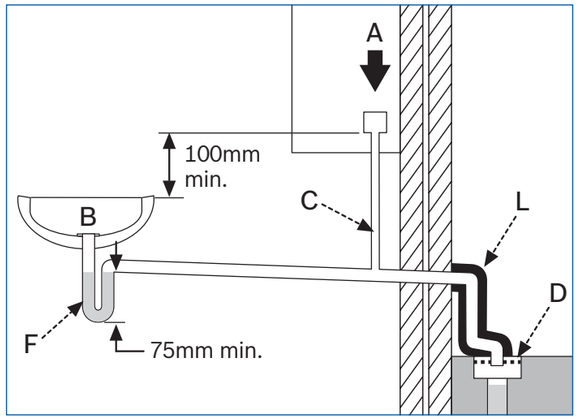
The condensate pipe can terminate into any one of five areas (see opposite).

Whilst all of the methods are acceptable it is always the best practise to terminate the condensate pipe via an internal waste system. This will eliminate the need for any external condensate pipe runs which can be susceptible to freezing in extreme weather. Best practise is not to run external condensate pipe any further than 3m. If it is necessary to run more than 3m externally increase pipe size to 32mm.

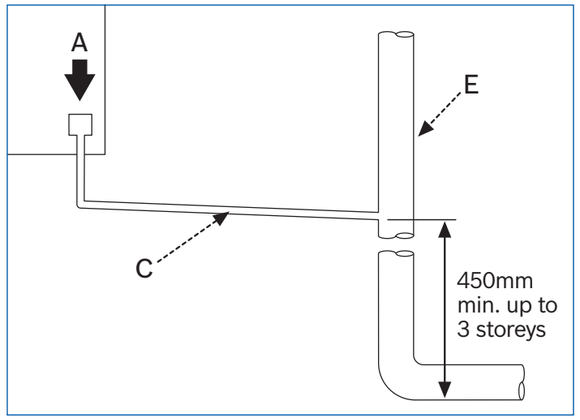
Condensate termination and route



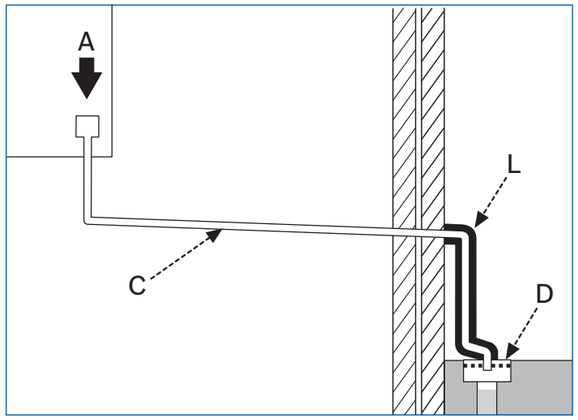
Internal sink/washing machine drain



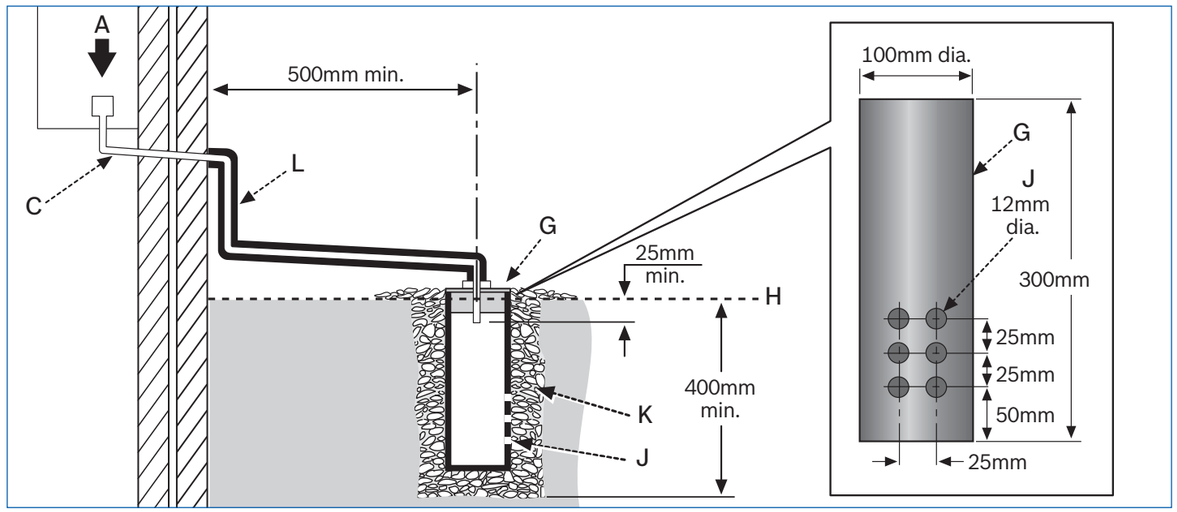
Internal waste drainage system



Soil and vent stack



External drainage system



External condensate absorption point (unsuitable for clay soil types)

A Condensate from boiler syphon/trap
B Sink with integral overflow
C 21.5mm dia. plastic condensate pipe
D External drain or gully. Open end of condensate drainage pipe direct into gully below grating but above water level
E Internal soil and vent stack
F Serviceable condensate trap (75mm min.)
G 300mm x 100mm dia. sealed plastic tube
H Ground level
J Drainage holes 50mm facing away from building
K Limestone chippings
L Weather resistant insulation

External condensate pipework

All Worcester Greenstar condensing boilers have within the appliance a syphonic condensate trap. Rather than the condensate constantly dripping into the discharge pipe, the condensate is collected into a trap which releases it in 100ml quantities. This will help prevent freezing occurring.

Wherever possible the condensate discharge pipework should be routed and terminated internally. Should this not be possible, and the only available route is external, the following conditions should be observed:

- The pipework length should be kept to a minimum and the route as vertical as possible
- Where pipework could be subjected to extreme cold or wind chill, a weather proof insulation should be used. **Alternatively, the condensate pipework could be increased to a minimum 32mm without the requirement to insulate.**

Fluing options

The appliance may be installed in any room, although particular attention is drawn to the requirements of the IEE regulations applicable and in Scotland the electrical provisions with respect to installation in a room containing a bath or shower.

Air supply

1. The room in which the appliance is installed does not require a purpose provided air vent.

2. If the appliance is installed in a cupboard or compartment with dimensions that allow the following minimum clearances, then no ventilation is required:

Compartment installation	
Position of appliance	**Min. unventilated clearance**
In front	75mm*
Below	200mm
Right side	100mm
Left side	100mm
Above flue elbow/casing	30mm

**75mm from an opening door. 600mm is required for servicing*

Boiler location and clearances

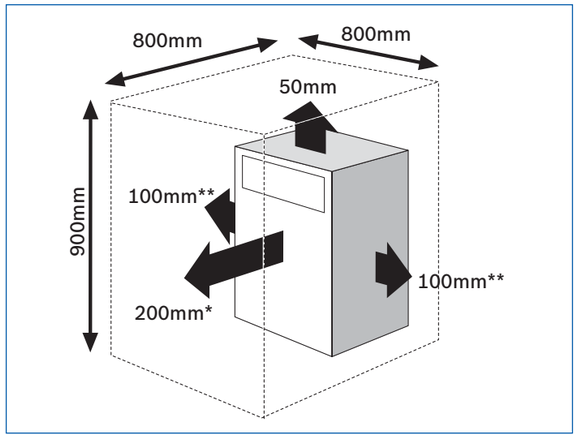
This boiler is only suitable for installing internally within a property at a suitable location on a fixed, rigid non-combustible surface of at least the same size as the boiler and capable of supporting the boiler weight.

Compartments: Follow the requirements of BS 6798 and BS 5440 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 perforated material (maximum hole sizes of 13mm) to separate the boiler from the airing space.

Unvented compartment clearances

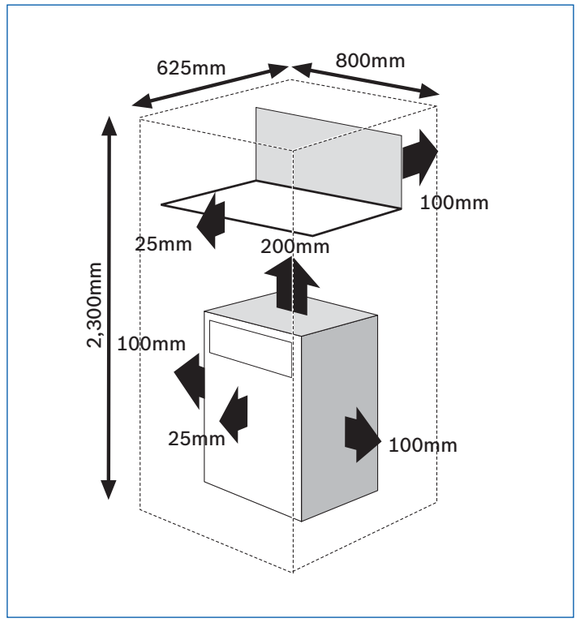
The diagram shows the minimum space required to install and service the boiler inside an unvented compartment.



**Space required for unvented areas with a removable door or panel.*
***This space can be reduced to 50mm for one side only as along as both the side clearances add up to the total of both the side measurements shown or more.*

Airing cupboard clearances

The diagram below shows the minimum space required to install and service the boiler within an airing cupboard.



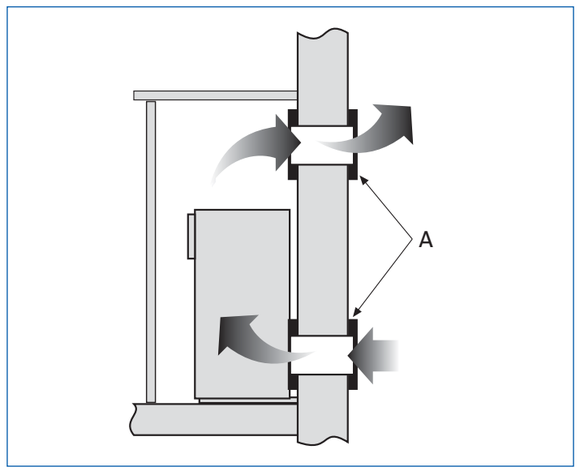
Venting compartments

If the clearances are less than those stated for the options above then ventilation must be provided as described in BS 5440.

A minimum of 2 air vents (A) must be fitted, one at low level and another at high level onto the same wall using the same air for circulation.

Minimum free air required for venting:

- For air directly from outside: 148cm^2 per vent.
- For air from internal space/room: 296cm^2 per vent.



Flue terminal positioning

General position

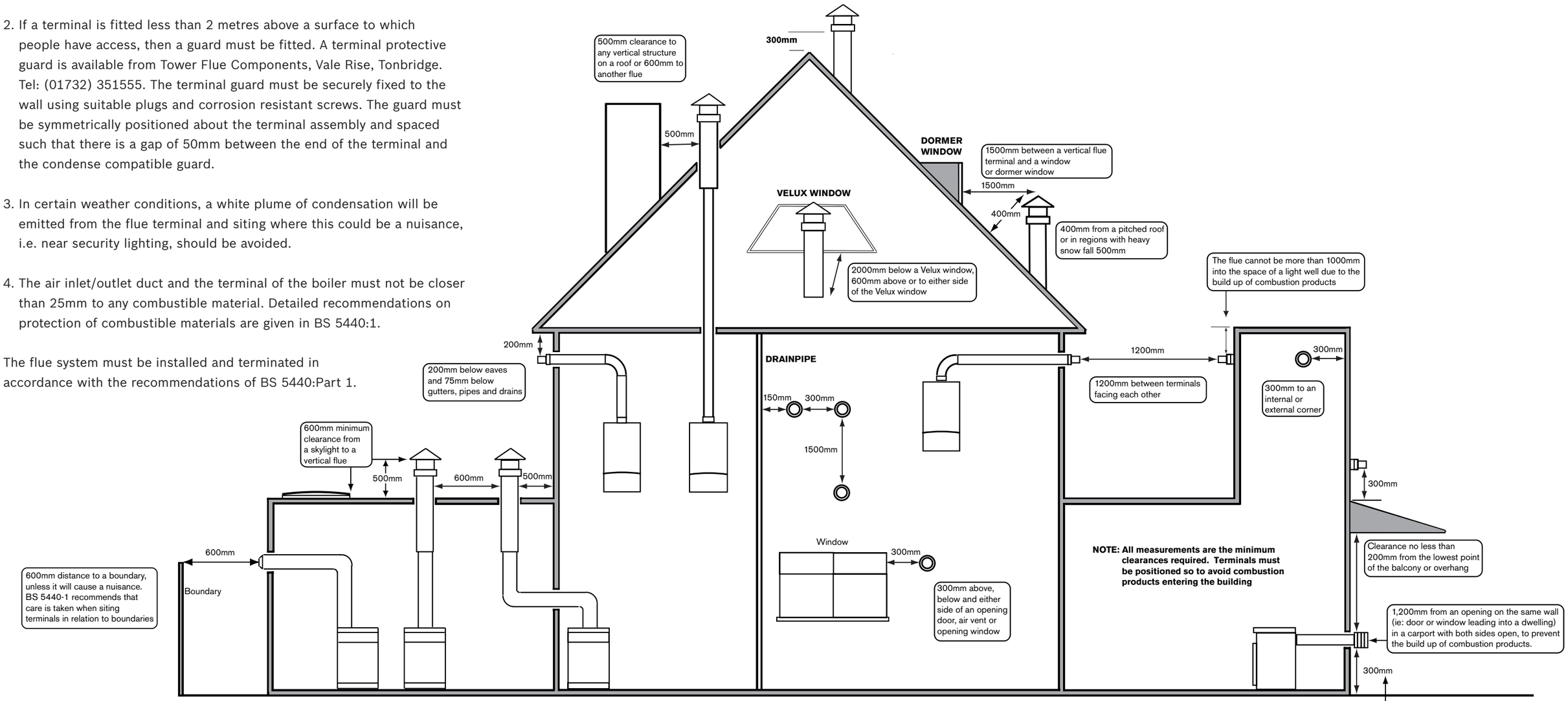
1. The terminal must not cause an obstruction nor the discharge a nuisance. Particular care should be exercised with regards to the pluming of the flue gases and any increase in noise levels.

2. If a terminal is fitted less than 2 metres above a surface to which people have access, then a guard must be fitted. A terminal protective guard is available from Tower Flue Components, Vale Rise, Tonbridge. Tel: (01732) 351555. The terminal guard must be securely fixed to the wall using suitable plugs and corrosion resistant screws. The guard must be symmetrically positioned about the terminal assembly and spaced such that there is a gap of 50mm between the end of the terminal and the condense compatible guard.

3. In certain weather conditions, a white plume of condensation will be emitted from the flue terminal and siting where this could be a nuisance, i.e. near security lighting, should be avoided.

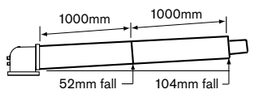
4. The air inlet/outlet duct and the terminal of the boiler must not be closer than 25mm to any combustible material. Detailed recommendations on protection of combustible materials are given in BS 5440:1.

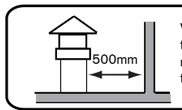
The flue system must be installed and terminated in accordance with the recommendations of BS 5440:Part 1.



Deduct one metre off the total flue length for every 45° bend used
Deduct two metres off the total flue length for every 90° bend used

The flue turret has a built-in angle of 3° to ensure that the condensate flows back to the boiler for safe disposal via the condensate waste pipe.
All horizontal flue sections must rise by 3° or at least 52mm for each metre away from the boiler to ensure condensate flows back into the boiler.





Vertical flue clearance 500mm to non-combustible building material, and 1,500mm clearance to combustible building material

If using a Plume Management kit refer to the separate instructions supplied with the kit

Greenstar Highflow 440 combi boiler horizontal fluing options

The Greenstar Highflow 440 has the choice of 2 different sized horizontal RSF flue systems, 100mm diameter and 125mm diameter. The systems have different maximum lengths. Options 1 to 9 detail the permissible lengths.

Horizontal RSF flue

Condensfit Highflow

Flue diameter	100mm	125mm
Minimum flue length	280mm	250mm
Maximum flue length	4,000mm	13,000mm

100mm dia. standard flue kit

Comprises:

1 x flue turret elbow

600mm (100mm dia.) of flue duct

Part No.

125mm dia. standard flue kit

1 x flue turret elbow

1,030mm (125mm dia.) of flue duct including terminal (as measured from centre of flue outlet)

Part No.

Accessories

	Worcester Part No.	
	100mm dia.	125mm dia.
Extension Flue Kit (1,000mm)		
Short Flue Extension (220mm)		
90º Bend		
45º Bend		

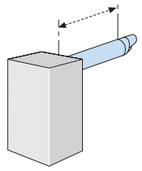
The following criteria should be noted when planning the installation.

- The concentric flue system must be inclined at 3º (50mm per metre) from the appliance, to allow condensate to drain back into the boiler.
- Because the appliance operates at high efficiency a white plume of condensation will be emitted from the terminal. Care must be taken when selecting the flue terminal position.

**The 100mm flue system inclines 2º within the 100mm terminal.*

Option 1

Standard horizontal rear flue assembly

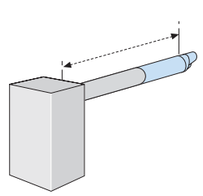


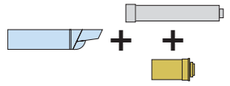
Maximum total straight flue length	100mm dia.	125mm dia.
Highflow 440	600mm	1,200mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Standard Flue Kit	1	
125mm	Standard Flue Kit	1	

Option 2

Extension rear flue horizontal flue assembly





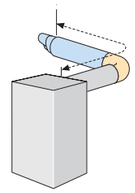
Maximum total straight flue length	100mm dia.	125mm dia.
Highflow 440	4,000mm	13,000mm

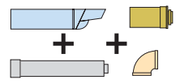
Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Standard Flue Kit	1	
100mm	Flue Extension	up to 4	
100mm	Short Flue Extension	As required	
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 12	

See the flue calculator for part numbers

Option 3

Extension rear flue horizontal using a 90º bend



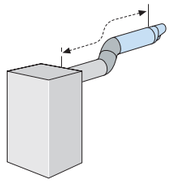


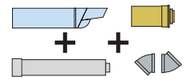
Maximum total straight flue length	100mm dia.	125mm dia.
Highflow 440	2,000mm	11,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Standard Flue Kit	1	
100mm	Flue Extension	up to 2	
100mm	Short Flue Extension	As required	
100mm	90º Bend	1	
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 10	
125mm	90º Bend	1	

Option 4

Extension rear flue horizontal using 45º bends





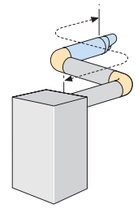
Maximum total straight flue length	100mm dia.	125mm dia.
Highflow 440	2,000mm	11,000mm

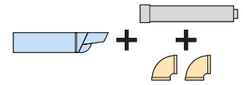
Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Standard Flue Kit	1	
100mm	Flue Extension	up to 2	
100mm	Short Flue Extension	As required	
100mm	45º Bend	2	
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 10	
125mm	45º Bend	2	

See the flue calculator for part numbers

Option 5

Extension rear flue horizontal using a second 90º bend



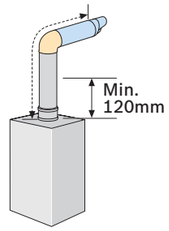


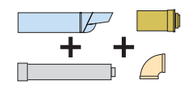
Maximum total straight flue length	100mm dia.	125mm dia.
Highflow 440	N/A	9,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 8	
125mm	90º Bend	2	

Option 6

Extension flue upwards and horizontal



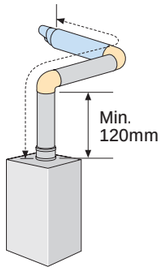


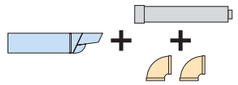
Maximum total straight flue length	100mm dia.	125mm dia.
Highflow 440	2,000mm	11,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Standard Flue Kit	1	
100mm	Flue Extension	up to 2	
100mm	Short Flue Extension	As required	
100mm	90º Bend	1	
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 10	
125mm	90º Bend	1	

Option 7

Extension flue upwards and horizontal using a second 90º bend



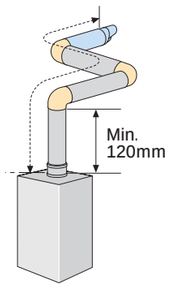


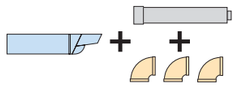
Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	N/A	9,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 8	
125mm	90º Bend	2	

Option 8

Extension flue upwards and horizontal using a third 90º bend



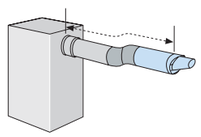


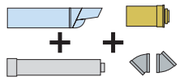
Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	N/A	7,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 6	
125mm	90º Bend	3	

Option 9

Side flue extension using two 45º bends





Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	2,000mm	11,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Standard Flue Kit	1	
100mm	Flue Extension	up to 2	
100mm	Short Flue Extension	As required	
100mm	45º Bend	2	
125mm	Standard Flue Kit	1	
125mm	Flue Extension	up to 10	
125mm	45º Bend	2	

See the flue calculator for part numbers

Greenstar Highflow 440 combi boiler vertical fluing options

The Greenstar Highflow 440 has the choice of 2 different sized vertical RSF systems, 100mm diameter and 125mm diameter. Both systems have different maximum lengths. Options 1 to 4 detail the permissible lengths.

Vertical RSF flue

Flue diameter	100mm	125mm
Flue terminal assembly diameter	120mm	135mm
Maximum flue length (inc. terminal)	6,400mm	15,000mm
Flue terminal assembly length	1,140mm	1,365mm

Vertical balanced flue kit

Comprises:

1 x flue terminal assembly

1 x weather sealing collar

1 x fire stop spacer

Part No. **(100mm dia.)**

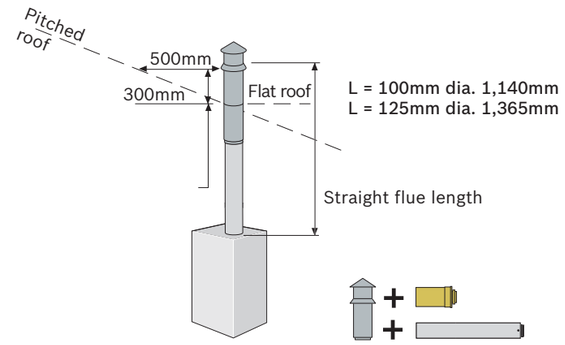
Part No. **(125mm dia.)**

Accessories

	Worcester Part No.	
	100mm dia.	125mm dia.
Extension Flue Kit (1,000mm)	7 716 191 083	
Short Flue Extension (220mm)	7 716 191 133	
90º Bend	7 716 191 084	
45º Bend	7 716 191 085	
Flat roof flashing kit	7 716 191 090	
Pitched roof flashing kit	7 716 191 091	

Option 1

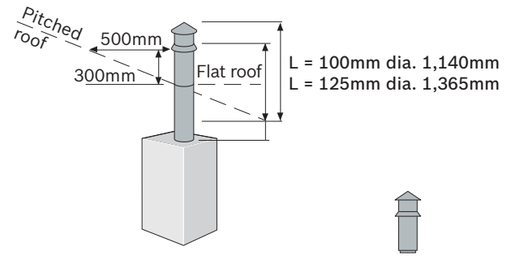
Vertical balanced flue system maximum height



Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	6,400mm	15,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Vertical Flue Kit	1	
100mm	Flue Extension	up to 6	
100mm	Short Flue Extension	As required	
125mm	Vertical Flue Kit	1	
125mm	Flue Extension	up to 14	

Minimum height

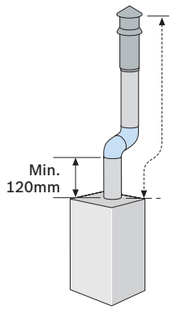


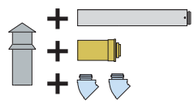
Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Highflow 440			
100mm	Vertical Flue Kit	1	
125mm	Vertical Flue Kit	1	

See the flue calculator for part numbers

Option 2

Vertical balanced flue system with two 45º bends



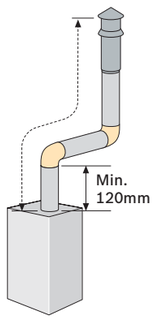


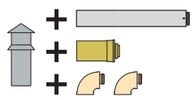
Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	4,400mm	13,000mm

Flue components required			
Flue Diameter	**Description**	**Quantity**	**Worcester Part No.**
Highflow 440			
100mm	Vertical Flue Kit	1	
100mm	Flue Extension	up to 4	
100mm	Short Flue Extension	As required	
100mm	45º Bend	2	
125mm	Vertical Flue Kit	1	
125mm	Flue Extension	up to 12	
125mm	45º Bend	2	

Option 3

Vertical balanced flue system with two 90º bends





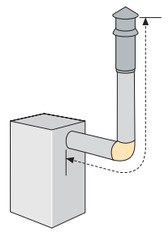
Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	2,400mm	11,000mm

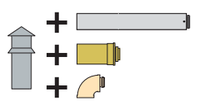
Flue components required			
Flue Diameter	**Description**	**Quantity**	**Worcester Part No.**
Highflow 440			
100mm	Vertical Flue Kit	1	
100mm	Flue Extension	2	
100mm	Short Flue Extension	As required	
100mm	90º Bend	2	
125mm	Vertical Flue Kit	1	
125mm	Flue Extension	up to 10	
125mm	90º Bend	2	

See the flue calculator for part numbers

Option 4

Side flue extension with 90º bend





Maximum total straight flue length		
	100mm dia.	125mm dia.
Highflow 440	2,400mm	11,000mm

Flue components required			
Flue Diameter	**Description**	**Quantity**	**Worcester Part No.**
Highflow 440			
100mm	Vertical Flue Kit	1	
100mm	Flue Extension	up to 2	
100mm	Short Flue Extension	As required	
100mm	90º Bend	1	
125mm	Vertical Flue Kit	1	
125mm	Flue Extension	up to 10	
125mm	90º Bend	1	

Installation requirements

Installation of the Greenstar Highflow 440 must be in accordance with the relevant requirements of the Gas Safety (Installation Use) Regulations (as amended), current IEE Wiring Regulations, local Building Regulations, Building Standards (Scotland) regulations and bylaws of the local Water company and Health and Safety Document No. 635 (Electricity at Work Regulations 1989). It should be in accordance with the relevant recommendations of the following British Standards:

BS 6798; BS 5449; BS 5546:1; BS 5440:1; BS 5440:2; BS 6891.

Gas Safety (Installation and Use) Regulations. All gas appliances must be installed by a CORGI registered person in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.

The manufacturers notes must not be taken in any way as overriding statutory regulations.

Sealed primary systems

The Worcester Greenstar Highflow 440 is supplied complete with all the necessary components to form a sealed primary system. Included are a pre-plumbed expansion vessel (12 litres), a pressure relief valve (set at 3bar), an automatic air vent and a pressure gauge.

The expansion vessel fitted to the appliance will accommodate differing system volumes, depending upon its initial charge pressure, and system pre-pressurisation. The table below shows the system volume that can be accommodated under different conditions. If it is found that the system volume exceeds that catered for by the expansion vessel fitted within the appliance, then an extra vessel should be added as close to the appliance as possible in the heating return pipe. Refer to BS 5449:1 and BS 6798:1 for further information.

Total system volume – litres (gallons)			
Initial system pressure (bar)	**Initial charge pressure (bar) 0.5**	**1.0**	**1.5**
0.5	130 (29)	–	–
1.0	80 (17.5)	102 (22.5)	–
1.5	43 (9.5)	58 (13)	71 (15.5)
2.0	20 (4.5)	27 (5.9)	33 (7.5)

System filling and make-up

To comply with the Water Authority requirements, the system should be filled via a temporary hose connection to the mains cold water supply, with a double check valve assembly and a test point fitted to the mains water side of the temporary circuit. This is supplied within the boiler.

Valves and joints

It is very important that all valves and joints are able to sustain a working pressure of up to 3bar (45psi). Particular care should be exercised when fitting radiator valves and only those of high quality to BS 2767:10 should be used. All other valves and fittings should comply with BS 1010.

Loss of water pressure from a sealed system will require continuous recharging with fresh water and consequential introduction of air. Air is highly corrosive and will considerably reduce life expectancy of radiators, pumps etc.

Plastic pipework

The use of plastic pipework is acceptable. However, some plastics are permeable to oxygen and must be avoided. Only pipework with a polymeric barrier should be used. Please note that the first 600mm of pipework connected to the boiler must be copper.

Open vented primary systems

It is not permissible to install the Greenstar Highflow 440 on an open vent system.

Natural gas supply

The appliance when on a full output demand will require up to 3.1m³/hr of gas. The gas meter and supply pipes must be capable of supplying this quantity of gas in addition to the demand from any other appliance being served. It is important that a gas supply pipe of at least 22mm diameter is used. Under no circumstances should the size of the gas supply pipe be less that of the appliance inlet connection. The meter outlet should be capable of ensuring a nominal pressure of 20mbar (8in wg) at the appliance. Particular consideration should be given to the resistance to gas flow created by elbows, bends etc. Pipework should be sized to overcome this resistance, details of this are given in the table below.

	Total length of gas supply pipe (m)			Pipe diameter (mm)
	3	6	9	–
Gas discharge rate m³/h	2.9	–	–	15
	8.7	5.8	4.6	22
	18.0	12.0	9.4	28

Approximate additional length to be allowed (natural gas)

Elbows or tees	
Metres	Feet
0.50	2

90º bends	
Metres	Feet
0.3	1

Liquid Petroleum Gas (LPG) supply

An LPG kit is an available accessory for the Greenstar Highflow 440. The appliance when on a hot water or full output demand will require up to 1.2m³/hr of gas. The gas tank or bottles must be capable of supplying this quantity of gas at a nominal pressure of 37mbar (14.8in wg) at the appliance. The table below shows the LPG discharge through varying lengths of pipe and the resistance to flow created by elbows, bends etc. Pipework should be sized so as to overcome this resistance.

	Total length of gas supply pipe (m)			Pipe diameter (mm)
	3	6	9	–
Gas discharge rate m³/h	8.0	5.2	4.2	22
	15.9	8.8	8.3	28

Approximate additional length to be allowed (LPG)

Elbows or tees	
Metres	Feet
0.6	2

90º bends	
Metres	Feet
0.3	1

Electricity supply

A 3amp fused three pin plug and unswitched shuttered socket outlet (both complying with BS 1363) or preferably a double pole isolator with a contact separation of 3mm in all poles supplying the appliance should be used.

The appliance electrical circuits are also protected by an internal 2.5amp fuse. The appliance must be earthed.

Mains cold water supply

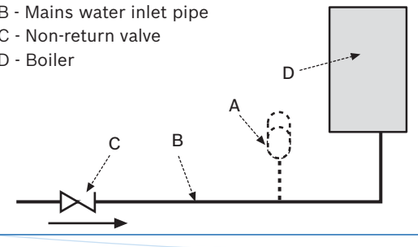
Water Authority requirement
A direct mains cold water connection is permitted by Water Authorities, however, it is recommended that reference be made to local requirements. In the event of difficulty contact the Worcester Technical Support Department.

Pipe sizing
Unless the mains pressure is low, a standard 15mm diameter service pipe is normally suitable. A 22mm hot water distribution pipe to the first branch is recommended thereafter 15mm and/or 10mm to all draw off points.

Cold water connection
Wherever possible the cold supply to the appliance should be the first connection off the mains supply, in order to minimise hot water flow reduction when cold water services are operated. The final 600mm of piping to the appliance should be of copper only.

Cold water pressure
To achieve the stipulated flow rate of 20l/min (4.4gpm) a working cold water mains pressure of 1.5bar is required. The appliance will operate at a minimum working pressure of only 0.5bar (7.5psi) however a reduced hot water flow rate should be expected. Back-flow prevention devices, including water meters, can prevent the expansion of hot water into the cold water main. However, this can result in a pressure build-up that may cause damage to the boiler and household devices such as showers, washing machines etc. In these cases we recommend that a mini-expansion vessel (Part No. 7 716 192 105) be fitted adjacent to the boiler in the cold water main.

MAINS WATER EXPANSION VESSEL:
A - Mini expansion vessel, Part No. 7 716 192 105
B - Mains water inlet pipe
C - Non-return valve
D - Boiler



Hot water supply

As with all mains fed systems, the flow rate of water obtainable from individual taps will vary in relation to the number of taps operating simultaneously, and will depend upon the cold mains supply available to the property.

Therefore, in order to avoid excessive starvation of flow to individual taps, flow balancing may be required by the use of proprietary constant volume flow regulators or Ball-o-Fix valves.

Hot water systems

Taps and valves
Hot and cold taps and mixing valves used with the Greenstar Highflow 440 appliance must be suitable for operating at a mains pressure of up to 10bar (150psi) and temperatures of 65°C (150°F).

Showers
When a loose head shower with a flexible hose is used over a bath or shower tray, the hose must be fixed so that the head cannot fall closer than 25mm (1in) above the top edge of the spill over level of the relevant bath or shower tray. Alternatively, the feed pipes to the shower should incorporate a double check valve assembly or a check valve and vacuum breaker.

With fixed head showers no provision is necessary.

The use of a thermostatically controlled shower will give added comfort and safeguard against high hot water temperatures.

Bidet
The supply of hot and cold water mains direct to a bidet is permitted provided that the bidet is of the overrim water feed type. The outlet(s) should be shrouded and not to have any temporary hand held spray attached. No other anti-syphonage arrangements are necessary.

Use in hard water areas

As the maximum temperature of the domestic hot water heat exchanger is limited by the electronic control circuit, there is normally no need for water treatment to prevent scale accumulation.

In areas where exceptional water conditions prevail, consideration may need to be given to the fitting of a device capable of preventing scale. In such circumstances the advice of the local water authority should be sought.

Warranty

The Worcester Greenstar Highflow 440 appliance is offered with a full 2 year guarantee* on parts and labour, a 10 year warranty* on the primary heat exchanger and a 5 year warranty* on the plate heat exchanger. Ongoing service and maintenance contracts can be arranged through the Worcester Customer Service Department.

**Subject to conditions.*

Greenstar Highflow 440 accessories

Twin channel programmer

Worcester Part No.
7 716 192 032

Night set-back module TR212E

Worcester Part No.
7 744 901 136

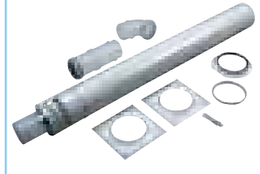
Optimising room temperature control TR2

Worcester Part No.
7 744 901 137

Horizontal flue kit (100mm dia.)

Worcester Part No.
7 719 002 434

Horizontal flue kit (125mm dia.)



Worcester Part No.
7 719 002 436

Vertical BF kit (100mm dia.)

Worcester Part No.
7 719 002 435

Vertical BF kit (125mm dia.)

Worcester Part No.
7 719 002 437

1,000mm extension (100mm dia.)

Worcester Part No.
7 716 191 083

Short flue extension 220mm (100mm dia.)

Worcester Part No.
7 716 191 133

1,000m extension (125mm dia.)

Worcester Part No.
7 719 001 892

45º bend (100mm dia.)

Worcester Part No.
7 716 191 085

45º bend (125mm dia.)

Worcester Part No.
7 719 001 899

90º bend (100mm dia.)

Worcester Part No.
7 716 191 084

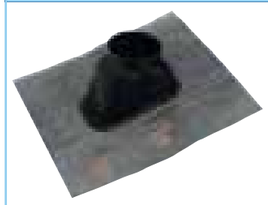
90º bend (125mm dia.)

Worcester Part No.
7 719 001 891

Flat roof flashing kit (100mm & 125mm dia.)

Worcester Part No.
7 716 191 090

Pitched roof flashing kit (100mm & 125mm dia.)



Worcester Part No.
7 716 191 091

Notes

Notes

A complete after-sales service

As part of the worldwide Bosch Group, Worcester strives to maintain the highest possible standards of after-sales care.

In addition to the no-nonsense parts and labour warranty applicable to all Worcester boilers, you and your customers have the assurance that every Worcester boiler is manufactured to both the appropriate British and European standards.

Worcester Contact Centre
Should you require support, our fully trained Contact Centre staff, based at our head office in Worcester, are ready to take your calls. Whatever your query our contact centre operators along with our nationwide team of engineers are ready to help you.

Boiler Protection Options
Worcester offers boiler protection including service and maintenance contracts. Please call the Worcester Service Centre for further details.

If you do not offer annual service and maintenance contracts please refer your customers to the Worcester Contact and Service Centre:

Tel: 08457 256 206
Fax: 01905 757 536

Opening Times
Monday – Friday: 7.00am – 10.00pm
Saturday: 8.00am – 5.00pm
Sunday: 9.00am – 12 noon

All the technical advice you need

Spares
Genuine replacement parts for all Worcester boilers are readily available from stock, on a next day delivery basis. For more information please call your local stockist.

Customer Technical Support
The Worcester Technical Helpline is a dedicated phone line – committed to providing a comprehensive service to complement the brand name and quality of our boiler products. Our experienced team of technical experts provides the answers to queries of a technical nature across the entire Worcester range.

Worcester also has a pre-sales department, which provides assistance in selecting a boiler system to suit a particular application, along with full guidance on installation. As well as this we will also assist in finding a recommended installer. For more information please contact the Technical Helpline or alternatively visit our website where literature can be downloaded **www.worcester-bosch.co.uk**

Technical
Tel: 08705 266 241
Fax: 01905 752 741

Opening Times
Monday – Friday: 7.00am – 8.00pm
Saturday: 8.30am – 4.00pm

The very best training programmes from Worcester

Worcester has always placed great emphasis on technical support and training for installers and service engineers. Today this need is greater than ever. The differences between a combi, conventional and system boiler are substantial, and the technology of each continues to advance at a rapid pace.

To ensure the highest levels of competence and expertise in the installation of all Worcester products, the company runs intensive training courses for installers, commissioning engineers and engineers involved with servicing and fault finding.

Courses available

Our training facilities offer a number of courses suitable for the installer and commissioning engineers, and a more in-depth course for the servicing and fault finding engineers.

Training Centres throughout the UK

Worcester's network of regional training centres are strategically located across the country and include the 'A' Rated Training Academy at the company's headquarters. This facility has recently been extended to include an oil-fired appliance workshop and a renewable energies workshop in addition to the extensive gas-fired training facilities.

In addition to these outstanding facilities there are centres at Clay Cross in Derbyshire and Bangor in Northern Ireland. Further 'A' Rated Academies are open at West Thurrock in Essex and Bradford in West Yorkshire as well as additional training opportunities available throughout the UK. Please phone 01905 752526 for more information about a course near you. Each course is run by specialist trainers and is superbly equipped to deliver a combination of classroom theory and practical hands-on experience that's second to none.

College-linked Learning

A number of the UK's leading proactive technical colleges are equipped with Worcester products and offer excellent practical tuition on a more local level.

Distance Learning

Worcester has produced a selection of Distance Learning CD ROMs/DVDs which are packed with information. Call 01905 752556 for your copies.

Mobile training

Our 7.5 tonne mobile oil training vehicle with working boilers, is now available throughout the country for hands-on oil training and OFTEC courses.

Get on course for a more profitable future now.

Call now for more information
01905 752526

www.worcester-bosch.co.uk

Excellence

Worcester training courses

Worcester training courses	
Greenstar CDi and Highflow 440 gas-fired condensing combi boilers	
Models covered	Greenstar 27/30/37/42CDi Greenstar Highflow 440
Duration	1 day
Greenstar i Junior and Si gas-fired condensing combi boilers	
Models covered	Greenstar 24/28i Junior Greenstar 25/30Si
Duration	1 day
Greenstar system and regular gas-fired condensing boilers	
Models covered	Greenstar 12/15/18/24Ri Greenstar 30/40CDi Conventional Greenstar 30CDi System Greenstar 12/24i System
Duration	1 day
Greenstar Camray high efficiency condensing oil-fired boilers	
Models covered	Greenstar Camray Greenstar Camray Utility Greenstar Camray Utility System Greenstar Camray External
Duration	1 day
Greenstar Danesmoor & Heatslave high efficiency condensing oil-fired boilers	
Models covered	Greenstar Danesmoor Greenstar Utility Greenstar Heatslave Greenstar Heatslave External
Duration	1 day
OFTEC Training	
OFTEC 101	
Covering	Domestic/Light Commercial Pressure Jet Commissioning and Servicing
Duration	3 day course (2 days training plus 1 days assessment)
OFTEC 105e	
Covering	Domestic/Light Commercial Pressure Jet Boiler Installation
Duration	1 day assessment
OFTEC 101 & 105e	
Covering	Domestic/Light Commercial Pressure Jet Installation, Commissioning and Servicing
Duration	3 day course (2 days training plus 1 days assessment comprising 2 theory and 1 practical)
OFTEC 600a	
Covering	Oil Tank Installation and Associated Controls
Duration	1 day assessment course
OFTEC 101/105e/600e	
Covering	Domestic/Light Commercial Pressure Jet Boiler Installation, Commissioning, Servicing and Oil Tank Installation and Associated Controls
Duration	4 days (2 days training and 2 days assessment)
Mobile OFTEC	
All above covered throughout the country on the mobile training vehicle as well as in all our centres.	

Certificate in Energy Efficiency for Domestic Heating Course	
Covering	Key elements of energy-efficient heating and hot water systems and products, compliance with the latest Building Regulations, how condensing boilers work and how they differ to non condensing products.
Duration	1 day
Unvented Cylinder Course	
Covering	All G3 Regulations for the Installation, Servicing and Commissioning of Unvented Cylinders. The course includes recognised accreditation by Logic Certification.
Duration	1 day
Greenskies Solar System	
Covering	Installation, Commissioning and Servicing The course includes recognised accreditation by Logic Certification for eligibility of low carbon buildings programme funding.
Duration	2 days
Greenstore Heat Pumps	
Covering	Installation, Commissioning and System Design
Duration	2 days

Useful numbers

Sales
Tel: 01905 752640
Fax: 01905 456445

Service
Tel: 08457 256206*
Fax: 01905 757536
Livingston (Scotland)
Fax: 01506 441687

Spare Parts
Tel: 01905 752576
Fax: 01905 754620

Training
Tel: 01905 752526
Fax: 01905 752535

Technical (Pre & Post Sales)
Tel: 08705 266241**
Fax: 01905 752741

Literature Line
Tel: 01905 752556
or download instantly
from our website

*Calls provided by BT will be charged at up to 4 pence per minute. A Call Set-up Fee of up to 6 pence per call applies to calls from residential lines. Mobile and other providers' costs may vary. See www.bt.com/pricing for details.
**Calls provided by BT will be charged at up to 7 pence per minute. A Call Set-up Fee of up to 6 pence per call applies to calls from residential lines. Mobile and other providers' costs may vary. See www.bt.com/pricing for details.

www.worcester-bosch.co.uk

The Council for Registered Gas Installers

iphe INDUSTRIAL ASSOCIATE

In partnership with energy saving trust™

HHIC HEATING & HOTWATER INDUSTRY COUNCIL

benchmark™ The mark of quality for domestic heating

Part No. 8 716 106 250 B 03/08

BBT1326

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Bosch Group
Worcester, Bosch Group,
Cotswold Way, Warndon,
Worcester, WR4 9SW
Tel: 01905 754624 Fax: 01905 754619