

The **Greenstar Camray** oil-fired regular and system condensing boiler series

Technical and specification information



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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

Contents

Page

The Greenstar Camray oil-fired regular & system condensing boiler series	4 - 7
Technical data	8 - 10
The inside story	11 - 15
Installing the Greenstar Camray series	16 - 22
Horizontal fluing options	23 - 24
– Camray regular (kitchen) & Utility, System (kitchen) & System Utility models	
Vertical fluing options	25 - 26
– Camray regular (kitchen) & Utility, System (kitchen) & System Utility models	
Oilfit conventional flexible flue liner	27
– Camray regular (kitchen) & Utility, System (kitchen) & System Utility models	
Oilfit external flue system horizontal fluing options	28
– Greenstar Camray external models	
Oilfit external flue system vertical fluing options	29 - 30
– Greenstar Camray external models	
Low level fluing options	31
– Greenstar Camray external models	
Installation requirements	32 - 39
The Greenstar Camray series accessories	40 - 42
Greenskies FKC and FKT series	43 - 45
Greenskies Cylinder series	46
After-sales	49
Worcester training	50 - 51



The Greenstar Camray regular and system oil-fired condensing boiler series



The Greenstar Camray series is part of a market leading range of energy-saving boilers.

Higher efficiency therefore highly cost effective

Greenstar Camray condensing boilers have an average annual efficiency (SEDBUK value) of up to 94.2%, efficiently producing heat for your heating and hot water. Standard efficiency boilers achieve around 78% efficiency. Therefore, a Greenstar Camray can cut heating and hot water bills and it's cheaper to run than an older boiler. Hence SEDBUK band A rating for the Greenstar Camray series.

The Greenstar Camray condensing combi boiler series delivers this energy-saving performance by recycling exhaust gases to extract 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 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. Greenstar Camray boilers come with the reassurance of a 2 year* parts and labour warranty with a 5 year* warranty on the primary heat exchanger.

*Subject to conditions

The Greenstar Camray series at a glance

	Greenstar Camray 12/18 models	Greenstar Camray 18/25 models	Greenstar Camray 25/32 models	
Output kW	Min	12kW	18kW	25kW
	Max	18kW	25kW	30kW
Kitchen regular model	•	•	•	
Kitchen System model	•	•	•	
Utility regular model	•	•	•	
Utility System model	•	•	•	
Conventional CF or RS room sealed from one appliance	•	•	•	

	Greenstar Camray External 12/18	Greenstar Camray External 18/25	Greenstar Camray External 25/32	
Output kW	Min	12kW	18kW	25kW
	Max	18kW	25kW	30kW
External model	•	•	•	
Low-level horizontal flue kit	•	•	•	
Vertical external flue kit	•	•	•	
High level horizontal external flue kit	•	•	•	

Please note that this leaflet is a guide to installation only. For full details please refer to the installation and servicing instructions.

Features	Benefits
Stainless steel secondary heat exchanger	High efficiency, SEDBUK Band A
Same footprint or smaller than standard efficiency models	Less disturbance during boiler replacement installations
100% testing of heat exchangers and burners	Exceptional quality and proven reliability
Compatible with Greenskies solar panels	Renewable and sustainable energy for the home
Conventional flue and room sealed balanced flue from one model – internal appliances only	Siting flexibility
Circular 'push-fit' flue system	Time saving
Top, left, right and rear flue options	Ease of installation
Optional fascia mounted programmer – Greenstar Camray kitchen models only	Reduced wiring
Robust quality manufacture	Excellence comes as standard
2 year* warranty with 5 year* warranty on primary heat exchanger	Worcester, Bosch Group after sales assurance
Oil isolation valve	Money saving
Manual reset thermostat	Sealed system compatibility
Condensate trap supplied	Ease of installation

*Subject to conditions

The Greenstar Camray regular and system oil-fired condensing boiler series

Options

There are 5 versions of the new Greenstar Camray oil-fired boiler series: regular (kitchen) and Utility, System (kitchen), System Utility and external.

Greenstar Camray (kitchen)

The Greenstar Camray regular (kitchen) versions are supplied as standard with a light grey fascia panel to which is mounted the boiler temperature controller, demand and lock out indicator lights.

The Greenstar Camray regular (kitchen) models also feature a removable panel into which the optional 7 day programmer can be fitted allowing the hot water and central heating system to be operated from the boiler.

Greenstar Camray System (kitchen)

The Greenstar Camray System (kitchen) models are a compact and highly-efficient range of appliances which include a circulating pump, pressure gauge, expansion vessel and pressure relief valve.

Greenstar Camray Utility regular

The Greenstar Camray Utility regular models are an economical series of appliances finished in a durable white casing. Within the cabinet is the temperature controller. The utility boiler is desirable when external controls are required.

Greenstar Camray Utility System

The Greenstar Camray Utility System models are a compact and highly-efficient range of appliances which include a circulating pump, pressure gauge, expansion vessel and pressure relief valve.

Greenstar Camray External

Where space in the kitchen or utility room is at a premium, why not choose from our Greenstar Camray External models? Built on the foundations of the Camray External heritage, the new condensing models incorporate Worcester's secondary heat exchanger technology.

The robust external cabinet design has been updated to ensure full weatherproofing and durability. The in-built frost thermostat protects the appliance from freezing.

Models

The Greenstar Camray regular (kitchen) and Utility, System (kitchen), System Utility and external series of oil-fired domestic central heating boilers cover outputs from 12/18kW, 18/25kW and 25/30kW and are available with a wide choice of different fluing options.

Oil

All of the Greenstar Camray appliances are for use on kerosene (28 second oil) fuel only.

Applications

- Greenstar Camray regular (kitchen) and Utility, System (kitchen) and Utility System appliances are designed to serve central heating and hot water requirements ranging from 12 to 30kW.
- Greenstar Camray regular (kitchen) and Utility, System (kitchen) and Utility System floor standing models have been designed to fit neatly between standard kitchen units and are therefore ideally suited to both kitchen or utility room installation.
- Greenstar Camray External models are designed to be an ideal solution for properties where internal floor space is limited.

The Greenstar Camray series is suitable for connection to a fully pumped primary water system. A gravity hot water system is not allowed under the building regulations.

Advantages

- All Greenstar Camray oil-fired boilers ensure optimum economy by operating at thermal efficiencies of at least SEDBUK Band A.
- The optional plug-in programmer on the kitchen models eliminates the need for external wiring of a programmer.
- All Greenstar Camray appliances are approved to the Boiler Efficiency Directive and are listed within the SEDBUK database as Band A.
- All Greenstar Camray floor standing boilers have a mild steel primary heat exchanger. This, combined with a stainless steel secondary heat exchanger which extracts additional latent heat from the flue gases, ensures a solid, robust product.

Special features

- Designed for easy installation and servicing.
- Many years' development has produced the optimum match of burner to boiler, ensuring maximum efficiency and exceptionally clean and quiet operation.
- Greenstar Camray boilers come with the reassurance of a 2 year* parts and labour warranty with a 5 year* warranty on the primary heat exchanger.

Flue options

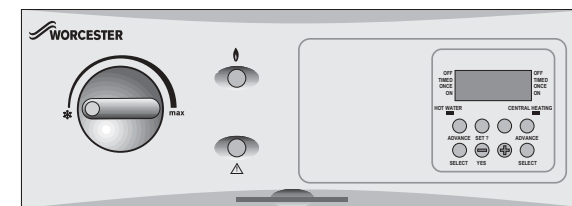
The Greenstar Camray internal range can be connected to a conventional flue system or a room sealed, multi-directional balanced flue system. After choosing the most suitable flue system and route, either the conventional flue adaptor or the appropriate RS flue kit(s) need to be specified. See page 23 for further details.

The Greenstar Camray External models must be connected to the Greenstar Oilfit External low-level horizontal system or the Oilfit External high-level horizontal/vertical flue systems.

User controls

An electronic 7 day twin-channel digital programmer is available as an optional extra for kitchen models only. This is fitted into the removable panel on the fascia. No wiring is required as the programmer simply plugs in.

When the appliance is used for central heating, provision is made for external controls, i.e. by room thermostat.



Greenstar literature

The appliance is dispatched complete with comprehensive installation, maintenance and user instructions.

User operating instructions for the 7 day twin channel programmer are contained within the programmer box.

**Subject to conditions*

Technical data – Greenstar Camray series

Model	Greenstar Camray (kitchen) 12/18	Greenstar Camray (kitchen) 18/25	Greenstar Camray (kitchen) 25/32	Greenstar Camray System (kitchen) 12/18	Greenstar Camray System (kitchen) 18/25	Greenstar Camray System (kitchen) 25/32
Height (mm)	855	855	855	855	855	855
Width (mm)	370	370	370	370	370	370
Depth (mm)	600	600	600	600	600	600
Weight (kg)	101	102	109	108	110	117
SEDBUK value/band	93.1%/Band A	93.2%/Band A	94.2%/Band A	93.1%/Band A	93.2%/Band A	94.2%/Band A
Solar compatible	•	•	•	•	•	•
Burner	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2
Optional plug-in twin channel digital controls	•	•	•	•	•	•
Min. diameter flue (CF) (mm)	100	100	130*	100	100	130*
Min. diameter flue (RS) (mm)	80/125	80/125	80/125 (H), 100/150 (V)	80/125	80/125	80/125 (H), 100/150 (V)
Open primary vent	1 inch BSP	1 inch BSP	1 ¹ / ₄ inch BSP	1 inch BSP	1 inch BSP	1 ¹ / ₄ inch BSP
Primary cold feed	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP
Heating flow & return connections	1 inch BSP, 22mm	1 inch BSP, 22mm	1 ¹ / ₄ inch BSP, 28mm	22mm	22mm	28mm
Condensate connection (polypropylene) (mm)	21.5	21.5	21.5	21.5	21.5	21.5
Condensate trap	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied
Oil connection (mm)	10	10	10	10	10	10
Max. primary static head (metres)	30	30	30	30	30	30
Min. primary static head (metres)	1	1	1	1	1	1
Primary water content (litres)	23	23	21	30	30	28
Water side resistance 20°C (mbar)	26	52	69	N/A	N/A	N/A
Available pump head 20°C	N/A	N/A	N/A	5.7 mH ₂ O	4.9 mH ₂ O	4.1 mH ₂ O
Exhaust flue gas mass flow (kg/hr)	29	40	51	29	40	51
Control thermostat range (°C)	55/81	55/81	55/81	55/81	55/81	55/81
Power supply	230V, 50Hz	230V, 50Hz	230V, 50Hz	230V, 50Hz	230V, 50Hz	230V, 50Hz
Power consumption (W)	150	160	160	255	265	265
Ingress protection rating	IP20	IP20	IP20	IP20	IP20	IP20
Flue reset overheat thermostat (cut out) (°C)	110	110	110	110	110	110
Boiler manual reset overheat thermostat (cut out) (°C)	105	105	105	105	105	105
Boiler high limit thermostat (cut out) (°C)	95	95	95	95	95	95
Max. horizontal flue RS 125mm dia. (mm)	4,000	4,000	4,000	4,000	4,000	4,000
Max. vertical flue RS 125mm dia. (mm)	8,000	8,000	N/A	8,000	8,000	N/A
Max. vertical flue RS 150mm dia. (mm)	N/A	N/A	8,000	N/A	N/A	8,000
Max. hearth temperature (°C)	<100	<100	<100	<100	<100	<100

*100mm when using 'Oilfit' flexible flue liner kit

Model	Greenstar Camray Utility 12/18	Greenstar Camray Utility 18/25	Greenstar Camray Utility 25/32	Greenstar Camray Utility System 12/18	Greenstar Camray Utility System 18/25	Greenstar Camray Utility System 25/32
Height (mm)	855	855	855	855	855	855
Width (mm)	370	370	370	370	370	370
Depth (mm)	600	600	600	600	600	600
Weight (kg)	101	103	110	109	111	118
SEDBUK value/band	93.1%/Band A	93.2%/Band A	94.2%/Band A	93.1%/Band A	93.2%/Band A	94.2%/Band A
Solar compatible	•	•	•	•	•	•
Burner	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2
Optional plug-in twin channel digital controls	-	-	-	-	-	-
Min. diameter flue (CF) (mm)	100	100	130*	100	100	130*
Min. diameter flue (RS) (mm)	80/125	80/125	80/125 (H), 100/150 (V)	80/125	80/125	80/125 (H), 100/150 (V)
Open primary vent	1 inch BSP	1 inch BSP	1 ¹ / ₄ inch BSP	1 inch BSP	1 inch BSP	1 ¹ / ₄ inch BSP
Primary cold feed	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP
Heating flow & return connections	1 inch BSP, 22mm	1 inch BSP, 22mm	1 ¹ / ₄ inch BSP, 28mm	22mm	22mm	28mm
Condensate connection (polypropylene) (mm)	21.5	21.5	21.5	21.5	21.5	21.5
Condensate trap	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied
Oil connection (mm)	10	10	10	10	10	10
Max. primary static head (metres)	30	30	30	30	30	30
Min. primary static head (metres)	1	1	1	1	1	1
Primary water content (litres)	23	23	21	30	30	28
Water side resistance 20°C (mbar)	26	52	69	N/A	N/A	N/A
Available pump head 20°C	N/A	N/A	N/A	5.7 mH ₂ O	4.9 mH ₂ O	4.1 mH ₂ O
Exhaust flue gas mass flow (kg/hr)	29	40	51	29	40	51
Control thermostat range (°C)	55/81	55/81	55/81	55/81	55/81	55/81
Power supply	230V, 50Hz	230V, 50Hz	230V, 50Hz	230V, 50Hz	230V, 50Hz	230V, 50Hz
Power consumption (W)	150	160	160	255	265	265
Ingress protection rating	IP20	IP20	IP20	IP20	IP20	IP20
Flue reset overheat thermostat (cut out) (°C)	110	110	110	110	110	110
Boiler manual reset overheat thermostat (cut out) (°C)	105	105	105	105	105	105
Boiler high limit thermostat (cut out) (°C)	95	95	95	95	95	95
Max. horizontal flue RS 80/125 (mm)	4,000	4,000	4,000	4,000	4,000	4,000
Max. vertical flue RS 80/125 (mm)	8,000	8,000	N/A	8,000	8,000	N/A
Max. vertical flue RS 100/150 (mm)	N/A	N/A	8,000	N/A	N/A	8,000
Max. hearth temperature (°C)	<100	<100	<100	<100	<100	<100

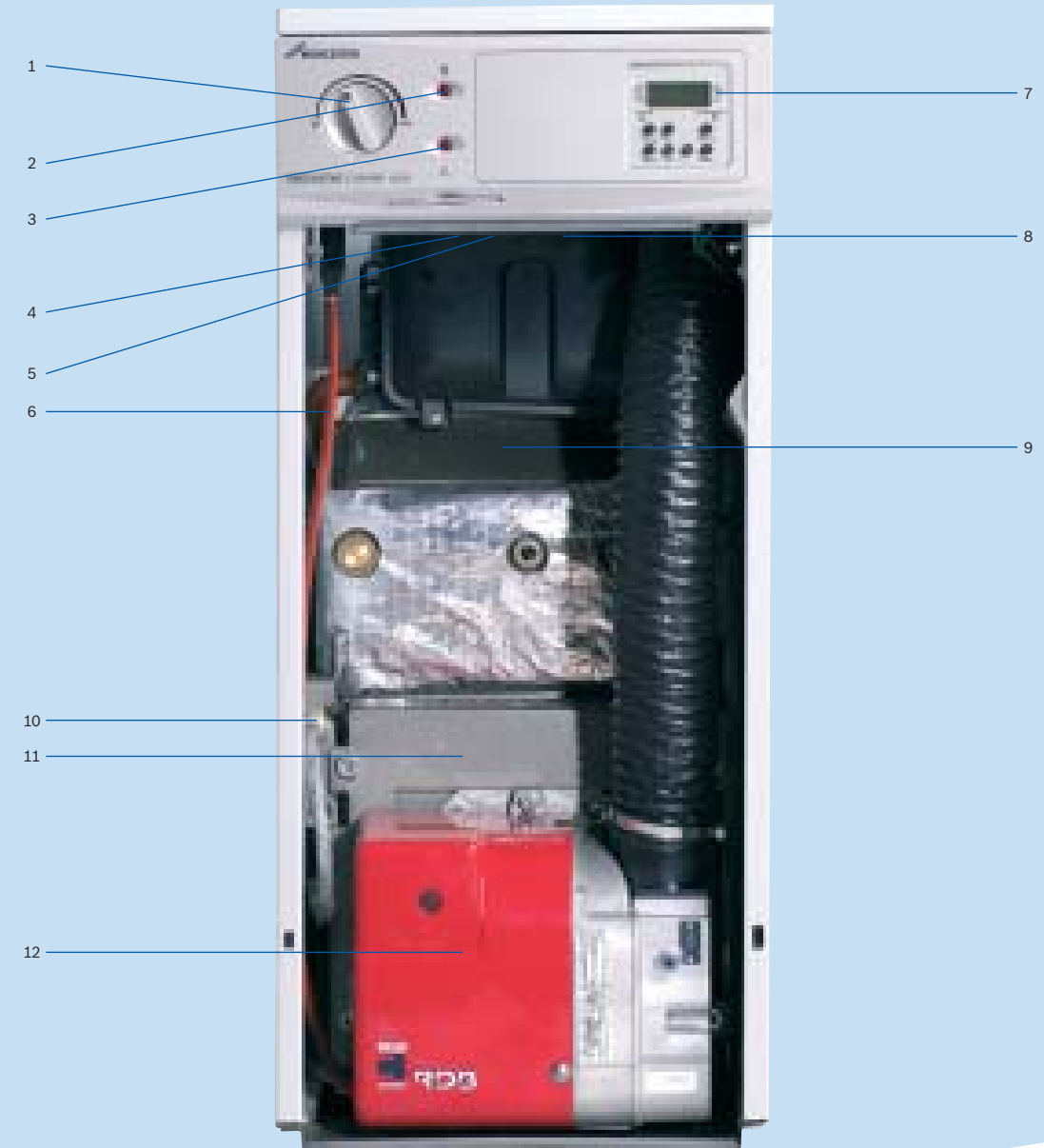
*100mm when using 'Oilfit' flexible flue liner kit

Technical data – Greenstar Camray series

Model	Greenstar Camray External 12/18	Greenstar Camray External 18/25	Greenstar Camray External 25/32
Height (mm)	950	950	950
Width (mm)	565	565	565
Depth (mm)	780	780	780
Weight (kg)	114	115	122
SEDBUK value/band	93.1%/Band A	93.2%/Band A	94.2%/Band A
Solar compatible	•	•	•
Burner	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2
Optional plug-in twin channel digital controls	-	-	-
Min. diameter flue (CF) (mm)	N/A	N/A	N/A
Min. diameter flue (RS) (mm)	80/125	80/125	80/125, 100/150
Open primary vent	1 inch BSP	1 inch BSP	1 ¹ / ₄ inch BSP
Primary cold feed	³ / ₄ inch BSP	³ / ₄ inch BSP	³ / ₄ inch BSP
Heating flow & return connections	1 inch BSP, 22mm	1 inch BSP, 22mm	1 ¹ / ₄ inch BSP, 28mm
Condensate connection (polypropylene) (mm)	21.5	21.5	21.5
Condensate trap	Accessory kit supplied	Accessory kit supplied	Accessory kit supplied
Oil connection (mm)	10	10	10
Max. primary static head (metres)	30	30	30
Min. primary static head (metres)	1	1	1
Primary water content (litres)	23	23	21
Water side resistance 20°C (mbar)	26	52	69
Available pump head 20°C	N/A	N/A	N/A
Exhaust flue gas mass flow (kg/hr)	29	40	51
Control thermostat range (°C)	55/81	55/81	55/81
Power supply	230V, 50Hz	230V, 50Hz	230V, 50Hz
Power consumption (W)	150	160	160
Ingress protection rating	IP45	IP45	IP45
Flue reset overheat thermostat (cut out) (°C)	110	110	110
Boiler manual reset overheat thermostat (cut out) (°C)	105	105	105
Boiler high limit thermostat (cut out) (°C)	95	95	95
Max. vertical flue RS 80/125 (mm)	7,000*	7,000*	N/A
Max. vertical flue RS 100/150 (mm)	N/A	N/A	7,000*
Max. hearth temperature (°C)	<100	<100	<100

*Excluding 1m horizontal run from boiler flue outlet.

The Greenstar Camray oil-fired condensing boiler series – inside story



Key to components

1. Temperature Control
2. Demand Indicator
3. Lock-out Indicator
4. Flue Overheat Reset Button
5. Boiler Overheat Reset Button
6. Burner Lead

7. Optional Digital Plug-in Programmer
8. Flue Gas Analyser Test Point (behind Control Box)
9. Baffle Retainer Access Door
10. Oil Supply Isolating Valve
11. Deflector Plate
12. Burner

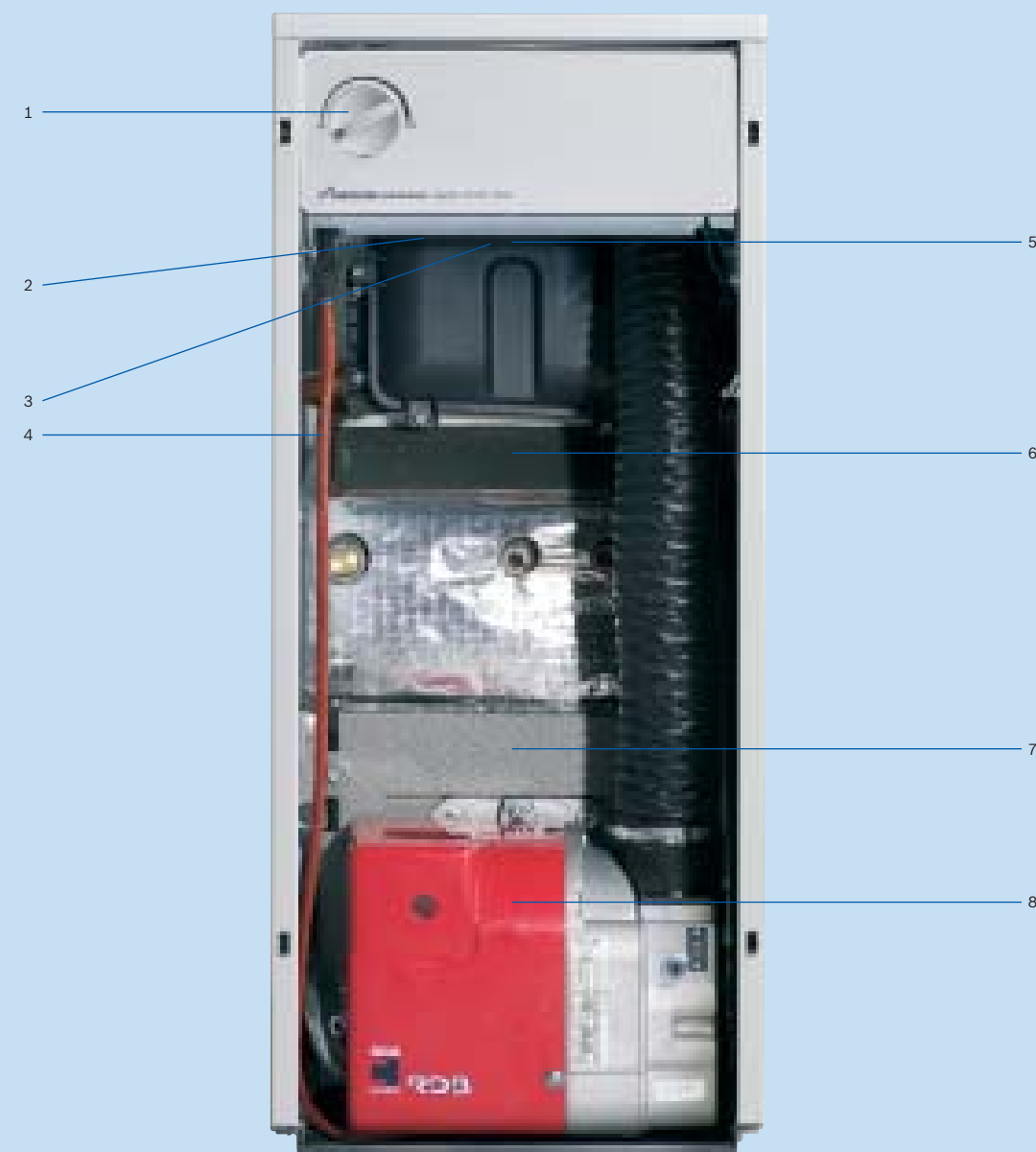
The Greenstar Camray System oil-fired condensing boiler series – inside story



Key to components

- | | |
|---|--|
| 1. Temperature Control | 6. Optional Plug-in Programmer Position |
| 2. Flue Overheat Reset Button (Under Control Box) | 7. System Pressure Gauge |
| 3. Boiler Overheat Reset Button | 8. Flue Gas Analyser Test Point (Behind Control Box) |
| 4. Pressure Relief Valve | 9. Baffle Retainer Access Door |
| 5. Expansion Vessel | 10. Circulating Pump |
| | 11. Expansion Vessel Bracket |
| | 12. Burner |

The Greenstar Camray Utility oil-fired condensing boiler series – inside story



Key to components

- | | |
|---|--|
| 1. Temperature Control | 4. Burner Lead |
| 2. Flue Overheat Reset Button (Under Control Box) | 5. Flue Gas Analyser Test Point (Behind Control Box) |
| 3. Boiler Overheat Reset Button | 6. Baffle Retainer Access Door |
| | 7. Deflector Plate |
| | 8. Burner |

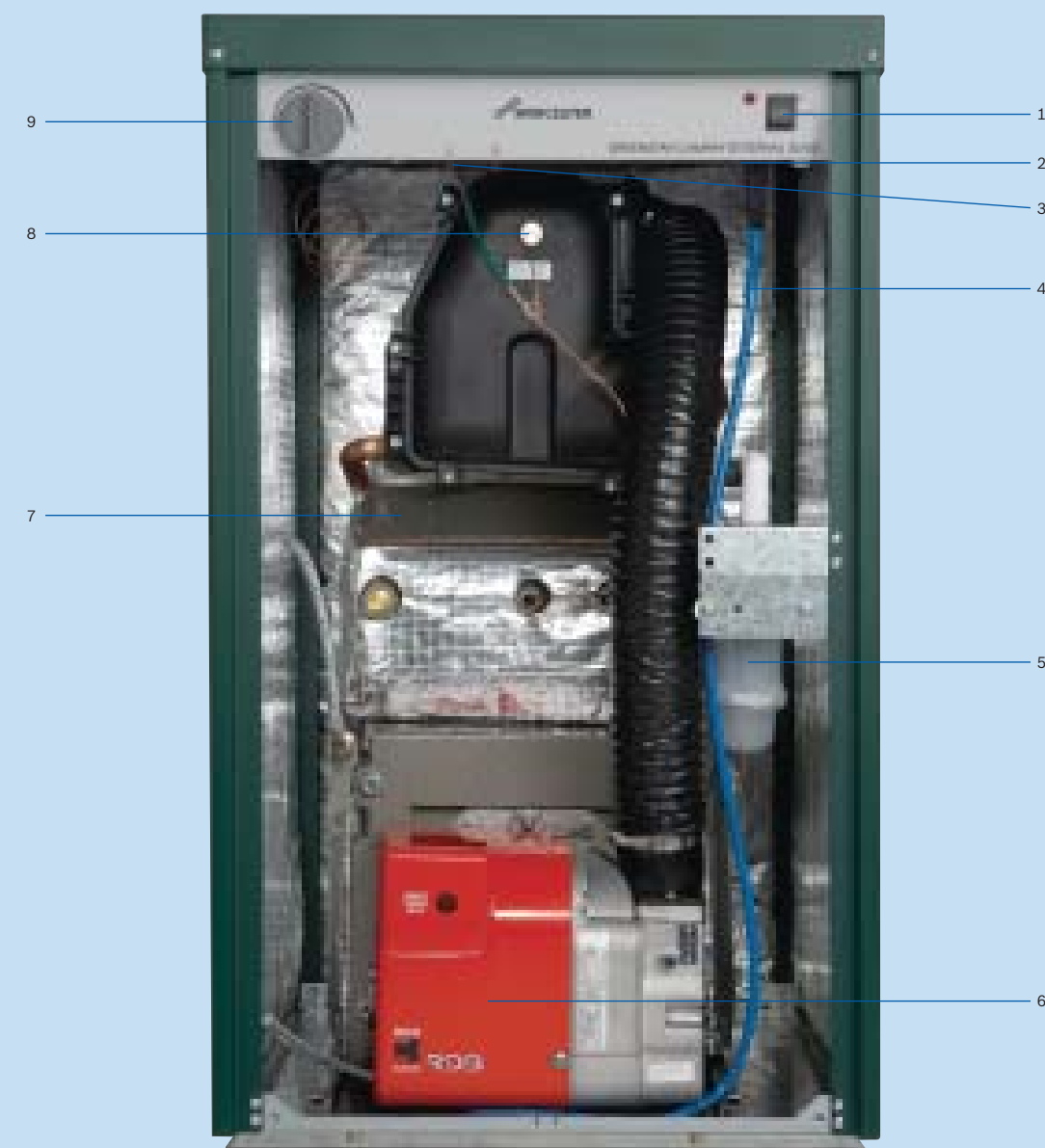
The Greenstar Camray Utility System oil-fired condensing boiler series – inside story



Key to components

- | | |
|--|---|
| 1. Temperature Control | 6. Expansion Vessel |
| 2. Flue Overheat Reset Button
(Under Control Box) | 7. System Pressure Gauge |
| 3. Boiler Overheat Reset Button | 8. Flue Gas Analyser Test Point
(Behind Control Box) |
| 4. Burner Lead | 9. Baffle Retainer Access Door |
| 5. Pressure Relief Valve | 10. Circulating Pump |
| | 11. Expansion Vessel Bracket |
| | 12. Burner |

The Greenstar Camray External oil-fired condensing boiler series – inside story



Key to components

- | | |
|---------------------------------|---|
| 1. Service Mode Switch | 5. Condensate Trap
(supplied as accessory) |
| 2. Boiler Overheat Reset Button | 6. Burner |
| 3. Flue Overheat Reset Button | 7. Baffle Retainer Access Door |
| 4. Burner Lead | 8. Flue Gas Analyser Test Point |
| | 9. Temperature control |

Installing the Greenstar Camray series

Installation

General

Greenstar Camray regular (kitchen) and Utility, System (kitchen) and System Utility oil-fired floor standing appliances are not suitable for external installation unless a suitable enclosure is provided. The floor must be firm and level.

The floor on which the boiler is to be mounted should be capable of supporting an overall weight of approximately 140kg. All models have a hearth temperature of below 100°C. The boilers do not therefore require a constructional hearth.

The appliances should however be positioned on a non-combustible solid base as near to the flue location point as possible: care should be taken to ensure that the appliance is level.

The Greenstar Camray External appliances are suitable for external installation only. The boilers should be sited on a firm and level, non-combustible base capable of supporting an overall weight of approximately 145kg.

For all external boilers consideration should be given to the location of the appliance and its flue outlet in relation to windows, doors and air vents. Care should be taken to ensure that pipework leaving the appliance and entering the building should not be exposed and the appliance should be sited as close to the dwelling as possible.

Flue system

The Greenstar Camray regular (kitchen) and Utility, System (kitchen) and System Utility appliances can be connected to either a conventional flue system or a multi directional, room sealed balanced flue. In either case either the conventional flue adaptor or the appropriate RS flue kit needs to be specified.

The Greenstar Camray External appliances can be connected to the Greenstar Oilfit External flue system providing balanced fluing options at low-level, high level or vertical outlets. The Oilfit External flue system can also be used on internal models.

All materials used on open flue systems must be able to sustain the corrosive elements present within the flue gases from condensing boilers. Worcester's Oilfit flexible flue liner

is available in a variety of lengths from 8m to 15m and is suitable for the Greenstar Camray range* (see installation manual for further details or contact our Technical Advice Centre). For other flue systems, guidance on the suitability of appropriate materials should be sought from the flue manufacturer. Worcester can supply a flexible flue liner suitable for CF chimney installations.

Siting of appliance

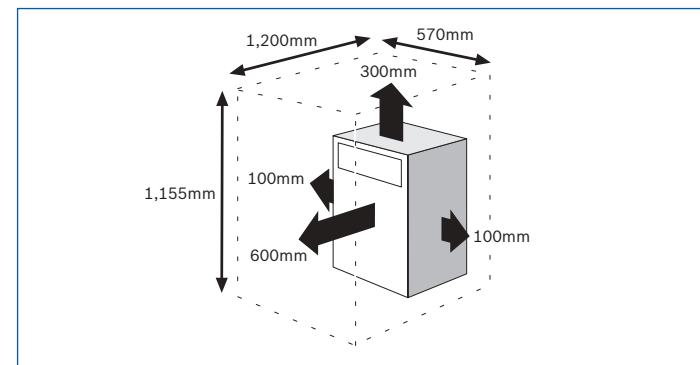
Clearances

The following clearances should be allowed for installation and servicing.

Recommended installation clearances

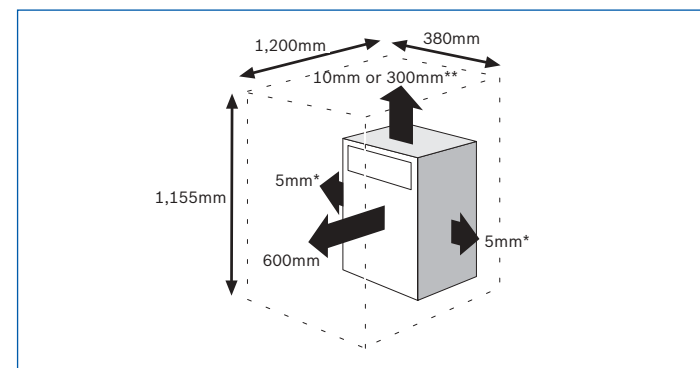
Greenstar Camray regular (kitchen) and Utility, System (kitchen) and System Utility

The minimum space required to install the boiler.



Recommended service, maintenance and repair clearances Greenstar Camray regular (kitchen) and Utility, System (kitchen) and System Utility

The minimum space required to service, maintain and repair the boiler.



*Note: Remove the flue 'knock-out' panel sections if this clearance is less than 75mm

**Note: Top: 300mm for maintenance and repair
Top: 10mm for annual service check

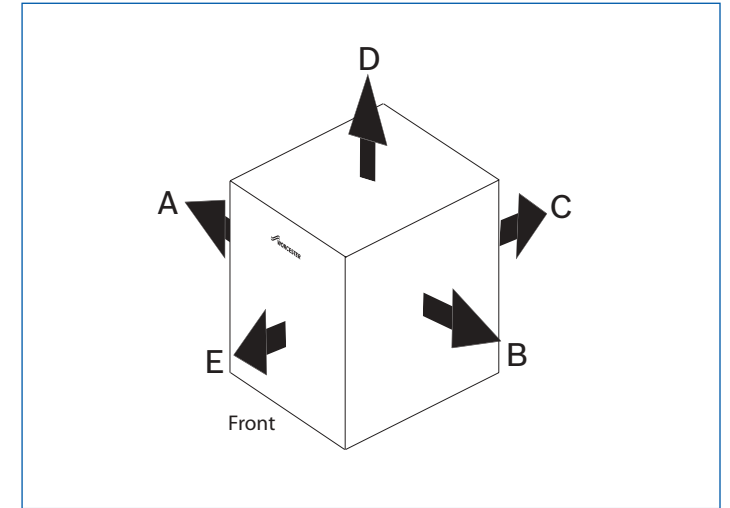
Recommended installation, service, maintenance and repair clearances Greenstar Camray External

The minimum space required to service, maintain and repair the boiler.

Flue orientation (mm) – external models			
Key	Right	Left	Rear
A	10	2,500*	85
B	2,500	10	45
C	50**	50**	2,500*
D	600	600	600
E	600	600	600

*From end of flue terminal allow 2,500mm clearance

**200mm if using a high level terminal exiting through the rear panel.

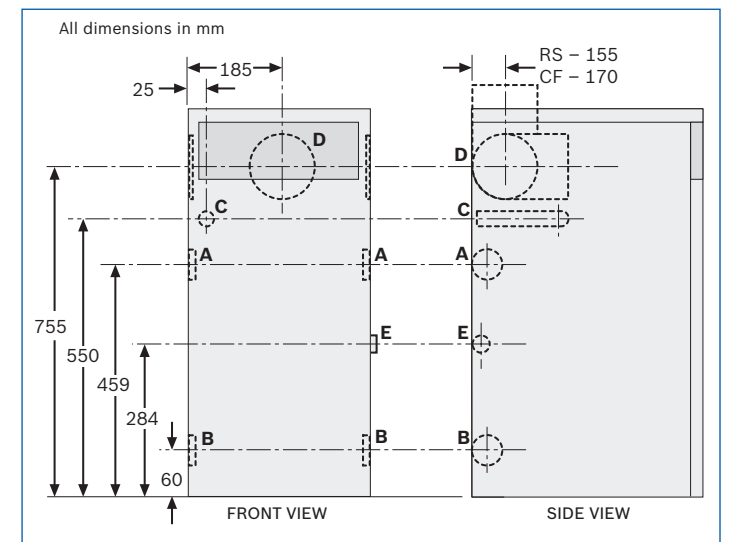


Pipework connections

Pipework positions Greenstar Camray (kitchen) and utility models

A to E (opposite) show the pipe positions from the front of the boilers:

Note: For servicing purposes, keep the condensate and pressure relief discharge pipes away from components and pipework connections.



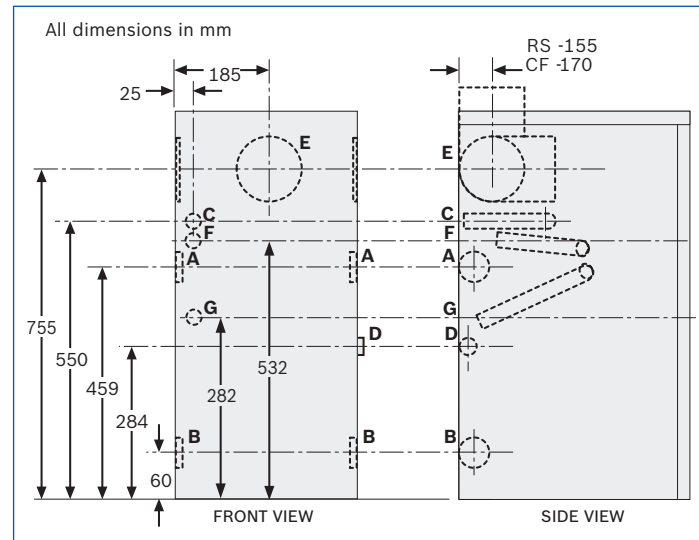
Pipework positions (kitchen and utility models)

Key	Description	Greenstar Camray (kitchen) & Camray Utility 12/18	Greenstar Camray (kitchen) & Camray Utility 18/25	Greenstar Camray (kitchen) & Camray Utility 25/32
A	CH flow/open vent	1" dia. BSP	1" dia. BSP	1 1/4" dia. BSP
B	Primary feed/drain	3/4" dia.	3/4" dia.	3/4" dia.
C	CH return	22mm dia. plain copper	22mm dia. plain copper	28mm dia. plain copper
D	Flue outlet	•	•	•
E	Condensate outlet	21.5mm dia.	21.5mm dia.	21.5mm dia.

Pipework positions Greenstar Camray System (kitchen) & Utility System models

A to G (opposite) show the pipe positions from the front and side of the boilers:

Note: For servicing purposes, keep the condensate and pressure relief discharge pipes away from components and pipework connections.

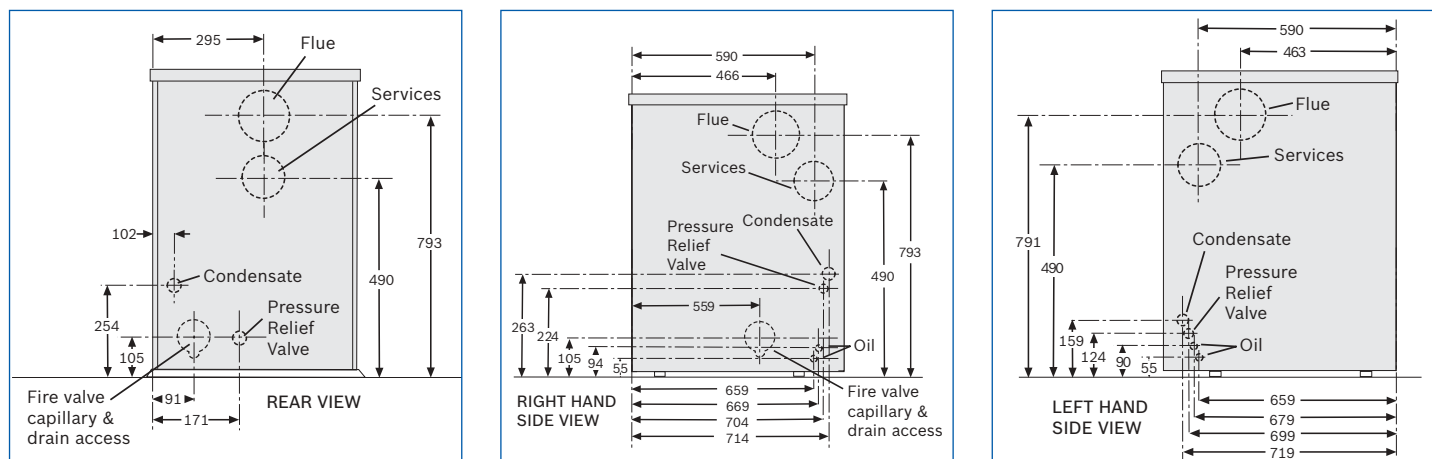


Pipework positions (kitchen system & utility system models)				
Key	Description	Greenstar Camray System (kitchen) & Utility System 12/18	Greenstar Camray System (kitchen) & Utility System 18/25	Greenstar Camray System (kitchen) & Utility System 25/32
A	Open vent	1" dia. BSP	1" dia. BSP	1 1/4" dia. BSP
B	Primary feed/drain	3/4" dia.	3/4" dia.	3/4" dia.
C	CH return	22mm dia. plain copper	22mm dia. plain copper	28mm dia. plain copper
D	Condensate outlet	21.5mm dia.	21.5mm dia.	21.5mm dia.
E	Flue outlet	•	•	•
F	CH Flow	22mm dia.	22mm dia.	28mm dia.
G	Pressure relief pipe	15mm dia.	15mm dia.	15mm dia.

Pipework positions Greenstar Camray External models

A to G (below) show the pipe positions from the front and sides of the boilers:

Note: For servicing purposes, keep the condensate and pressure relief discharge pipes away from components and pipework connections.



All dimensions in mm

Pipework exit options from cabinet (external models)			
Description	Greenstar Camray External 12/18	Greenstar Camray External 18/25	Greenstar Camray External 25/32
CH flow/open vent	1" dia. BSP	1" dia. BSP	1 1/4" dia. BSP
Primary feed/drain	3/4" dia.	3/4" dia.	3/4" dia.
CH return	22mm dia. plain copper	22mm dia. plain copper	28mm dia. plain copper
Flue outlet	80/125mm dia.	80/125mm dia.	80/125mm dia. & 100/150mm dia.
Condensate outlet	21.5mm dia.	21.5mm dia.	21.5mm dia.

Condensate pipework

Pipe size and type

- Use plastic pipework of a diameter no less than 21.5mm.

Routing the pipework

Wherever possible, the condensate pipework should be routed internally to prevent freezing.

- The condensate pipework must fall at least 50mm per metre towards the outlet
- Take the shortest practicable route
- Support the pipe at least every 0.5m for near horizontal sections and 1m for vertical sections.

When a boiler is to be installed in an unheated location, such as a garage, all condensate drainage pipes should be considered as external.

External pipework

- The pipework length should be kept to a minimum and the route as vertical as possible
- Do not exceed 3 metres outside the dwelling
- Terminate as close to the ground or drain as possible (below the grating and above the water level) while still allowing for safe dispersal of the condensate. This helps to reduce wind blowing up the pipe and freezing.

Connection of a condensate drainage pipe to a drain may be subject to local building controls

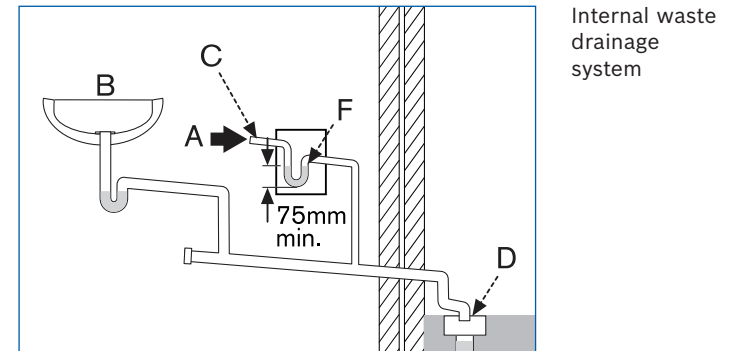
- Pipework subject to extreme cold or wind chill conditions should be 32mm dia. pipe

- Protect **all** external pipework with weather resistant insulation and box-in, if necessary, to reduce the risk of freezing.

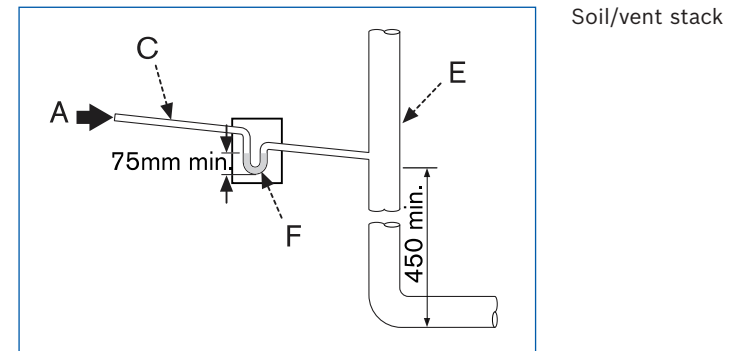
Making it safe

- Condensate pipework must not leak, freeze or block up
- Condensate traps must be filled before firing up the boiler to prevent the possibility of potentially harmful flue products evacuating via the condensate route.

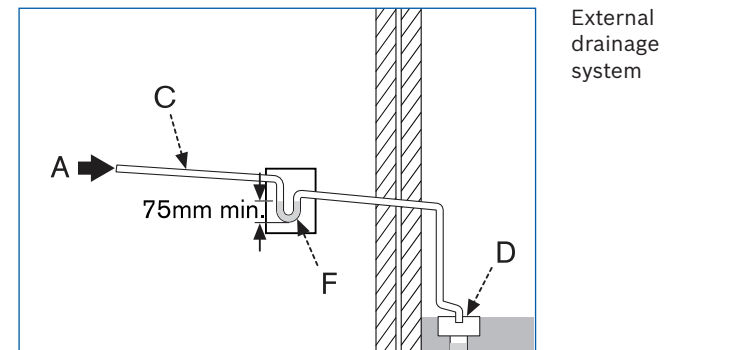
Condensate can be discharged into a rainwater hopper which is part of a sewer system carrying both rainwater and foul water.



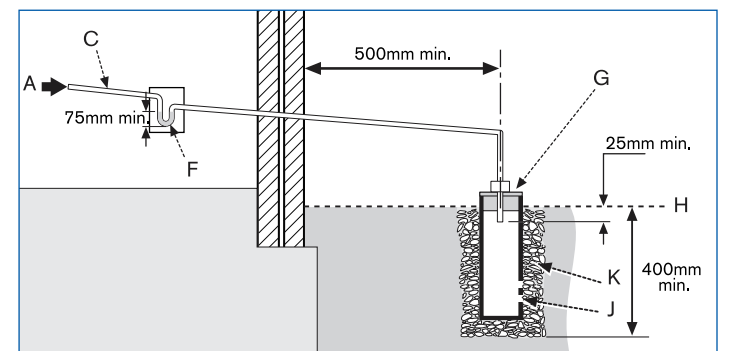
Internal waste drainage system



Soil/vent stack



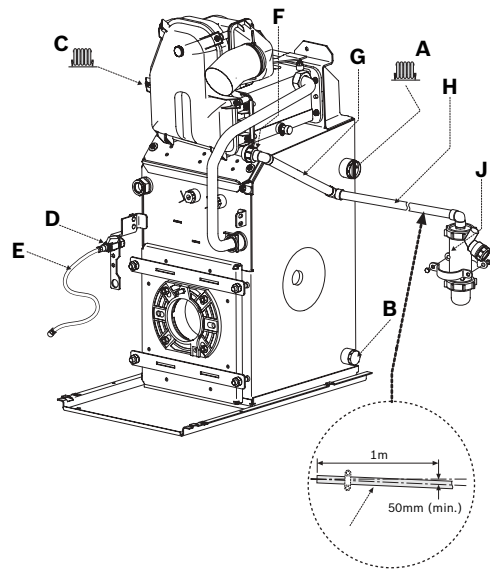
External drainage system



External condensate absorption point – unsuitable for clay soil types

- A Condensate from boiler
- B Sink
- C 21.5mm dia. plastic polypropylene condensate pipe
- D Drain
- E Internal soil and vent stack
- F Condensate trap – supplied
- G 300mm x 100mm dia. sealed plastic tube
- H Ground level
- J Drainage holes 50mm from base of tube (12mm dia. at 25mm centres) facing away from building
- K Limestone chippings

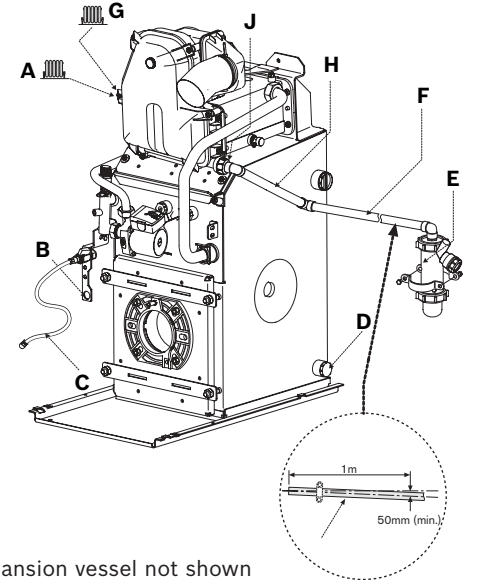
Greenstar Camray (kitchen) and Camray Utility



- A CH flow/open vent
- B Primary drain
- C CH return plain ended copper
- D Oil pipe isolating valve
- E Flexible oil pipe
- F Condensate outlet (21.5mm dia.)
- G Flue manifold outlet
- H Condensate pipe – not supplied
- J Condensate trap with wall clamp – supplied

Condensate trap is installed within the cabinet – Greenstar Camray External models only.

Greenstar Camray System (kitchen) and Utility System



- A CH return plain ended copper
- B Oil pipe isolating valve
- C Flexible oil pipe
- D Primary drain
- E Condensate trap with wall clamp – supplied
- F Condensate pipe – not supplied
- G CH flow
- H Flue manifold outlet
- J Condensate outlet (21.5mm dia.)

NB. Expansion vessel not shown

Fluing options

Air supply – CF (conventional flue)

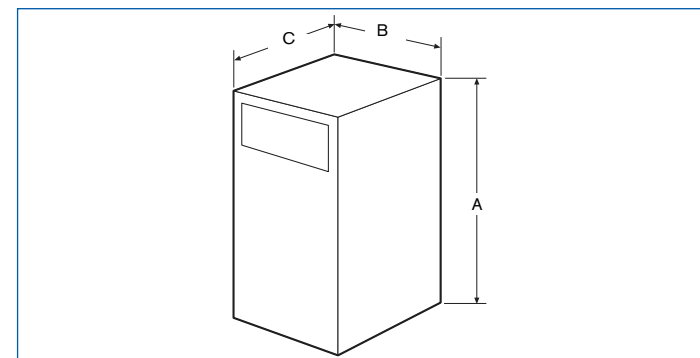
An adequate supply of free air must be delivered to the boiler for combustion purposes through a permanent inlet, such as an air brick, into the area where the boiler is situated.

Combustion air must not be taken from bathroom or bedroom areas.

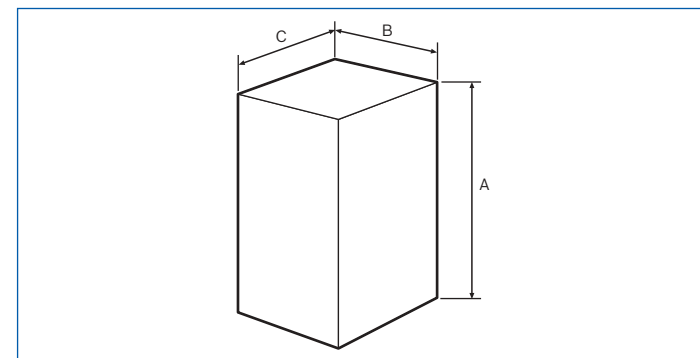
Minimum area of air inlet for combustion**	
Model	Area (cm ²)
12/18	99
18/25	138
25/32	165

** Due to changes to BS 5410 and modern building design, these figures no longer incorporate the adventitious ventilation allowance.

Casing dimensions



Cabinet dimensions (mm) (kitchen, system kitchen, utility & utility system models)			
Key	12/18	18/25	25/32
A	855	855	855
B	370	370	370
C	600	600	600



Cabinet dimensions (mm) (external models)			
Key	12/18	18/25	25/32
A	950	950	950
B	565	565	565
C	780	780	780

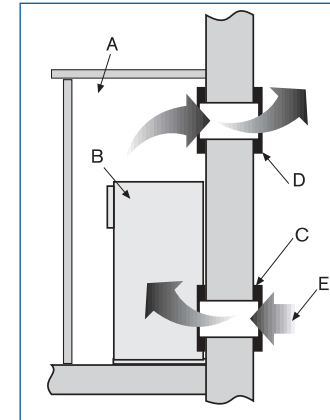
Compartment clearances

Follow the requirements of BS5410 and note:

- Minimum clearances must be maintained.
- An access door is required to install, service and maintain the boiler and any ancillary equipment, i.e. condensate trap.
- If fitting the boiler into an airing cupboard use a non-combustible material (if perforated, maximum hole sizes of 13mm) to separate the boiler from the airing space.

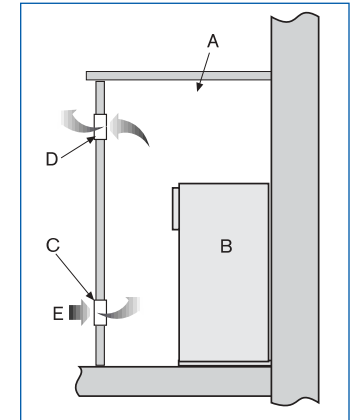
Compartment ventilation

- Ventilation must be provided for boilers fitted into compartments as described in BS5410.
- A minimum of 2 air vents must be fitted, one at low level (C) and another at high level (D) onto the same wall using the same air (E) for circulation.
- Free air must not be taken from a room or internal space containing a bath or shower and must not communicate with a protected area such as a hall, stairway, landing, corridor, lobby, shaft, etc.
- Air vents must allow access for clean free air and must be sited to comply with the flue terminal position requirements.
- Air ducting runs must not exceed 3m.
- Low level air vents must be less than 450mm from the floor.
- A warning label must be added to the vents with a statement to the effect: “Do not block this vent. Do not use for storage”.



External ventilation

- A Compartment
- B Boiler
- C Low level vent



Internal ventilation

- D High level vent
- E Air supply

Conventional flue**

Minimum air vent area (cm ²) for appliances installed in a compartment				
Model	Internal ¹ ventilation		External ² ventilation	
	High level	Low level	High level	Low level
12/18	198	297	99	198
18/25	275	413	138	275
25/32	330	495	165	330

Room sealed flue**

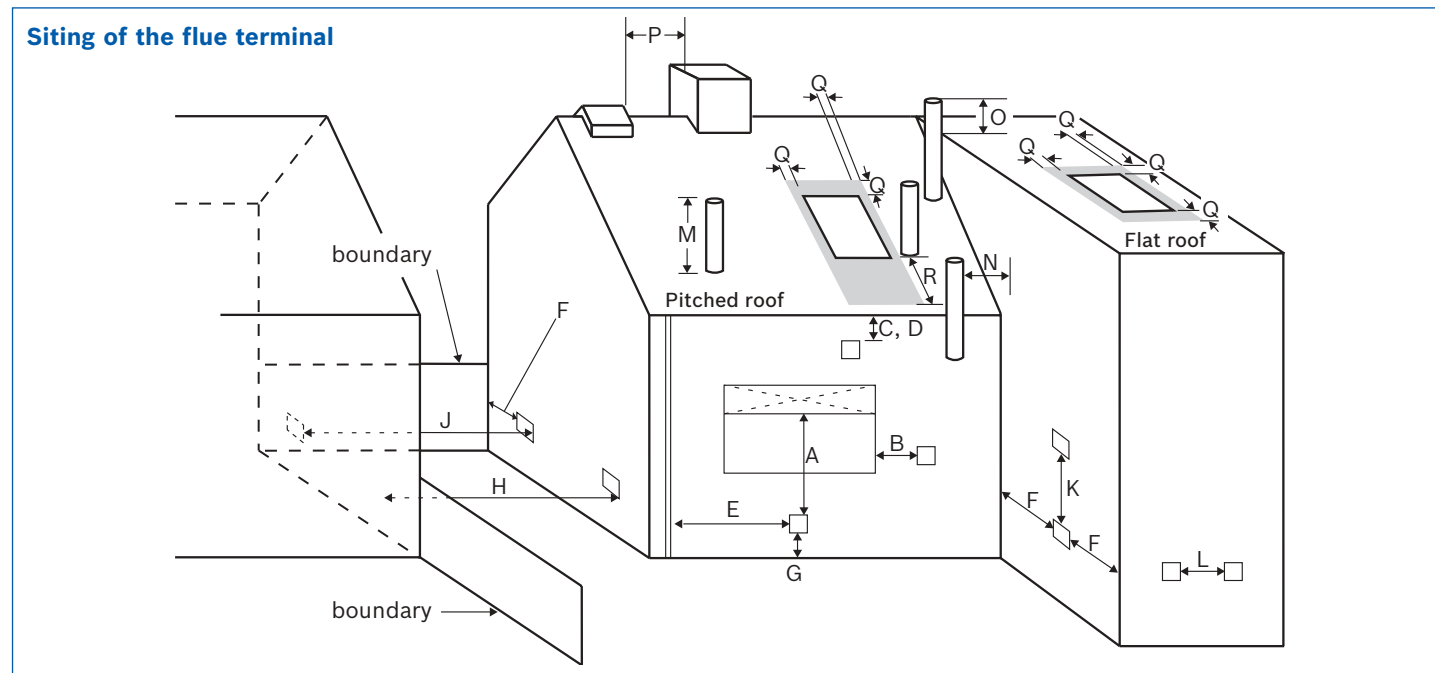
Minimum air vent area (cm ²) for appliances installed in a compartment				
Model	Internal ¹ ventilation		External ² ventilation	
	High level	Low level	High level	Low level
12/18	198	198	99	99
18/25	275	275	138	138
25/32	330	330	165	165

¹ Internal air to and from a space/room inside the building.

² External air to and from directly outside the building.

** Due to changes to BS 5410 and modern building design, these figures no longer incorporate the adventitious ventilation allowance.

Flue terminal positioning



Key to illustration

Minimum dimensions of flue terminal positions for oil-fired appliances:

Terminal position (mm)	CF	RS(H)	RS(V)
A ¹² Directly below an opening, air brick, opening window, etc	N/A	600	N/A
B ¹² Horizontally to an opening, air brick, opening window, etc	N/A	600	N/A
C Below a plastic/painted gutter, drainage pipe or eaves if combustible material protected	N/A	75	N/A
D ³ Below a plastic/painted gutter, drainage pipe or eaves without protection to combustible material	N/A	600	N/A
E From vertical sanitary pipework	N/A	300	N/A
F From an external or internal corner or from a surface or boundary alongside the terminal	N/A	300	N/A
G Above ground or balcony level	N/A	300*	N/A
H From a surface or boundary facing the terminal	N/A	600**	N/A
J From a terminal facing the terminal	–	1,200**	–
K Vertically from a terminal on the same wall	N/A	1,500	N/A
L Horizontally from a terminal on the same wall	–	750	–
M Above the point of highest intersection with the roof	600	–	600
N From a vertical structure to the side of the terminal	750	–	750
O Above a vertical structure less than 750mm from the side of the terminal	600	–	600
P From a ridge terminal to a vertical structure on the roof	1,500	–	N/A
Q Above or to the side of any opening on a flat or sloping roof	300	–	300
R Below any opening on a sloping roof	1,000	–	1,000

Key: – N/A Not allowed, CF Conventional Flue, RS(H) Room Sealed Horizontal flue, RS(V) Room Sealed Vertical flue.

Notes:

- Terminals should be positioned so as to avoid products of combustion accumulating in stagnant pockets around the building or entering into buildings.
- Vertical structure in N, O and P includes tank or lift rooms, parapets, dormers etc.
- Terminating positions should be at least 1.8m from an oil storage tank unless a wall with at least 30 min fire resistance and extending 300mm higher and wider than the tank is provided between the tank and the terminating position.
- Where a flue is terminated less than 600mm away from a projection above it and the projection consists of plastics or has a combustible or painted surface, then a heat shield of at least 750mm wide should be fitted.
- If the lowest part of the terminal is less than 2m above the ground, balcony, flat roof or other place to which any person has access, the terminal should be protected by a guard.
- Notwithstanding the dimensions given above, a terminal should not be sited closer than 300mm to combustible material. In the case of a thatched roof, double this separation distance should be provided. It is also advisable to treat the thatch with a fire retardant material and close wire in the vicinity of the flue.
- It is essential that a flue or chimney does not pass through the roof within the shaded area delineated by dimensions Q and R.
- Where protection is provided for plastic components, such as guttering, it is essential that this is to the standard specified by the manufacturer of the plastic components.

- Flue terminals must be positioned to avoid combustion products entering into buildings.
- The flue must be fitted and terminated in accordance with the recommendations of BS 5410.
- The flue must not cause an obstruction.
- Discharge from the flue outlet must not be a nuisance.
- Flue gases have a tendency to plume and in certain weather conditions a white plume of condensation will be discharged from the flue outlet which could be regarded as a nuisance, for example, near security lighting.
- There should be no restriction preventing the clearance of combustion products from the terminal.
- 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 5410:1
- A protective terminal guard must be fitted if the terminal is 2m or less above a surface where people have access. The guard must be spaced equally (minimum 50mm) around the flue and fixed to the wall with plated screws.

Stainless steel terminal guard

Part No: 7 716 190 050

The following additional guidelines (from part L Exceptions Guidance Document) are recommended when determining the flue outlet position:

- Avoid discharging flue gases into car ports or narrow passageways.
- *Minimum distance of the flue terminal from above ground is 2,100mm where directed to a public footpath, private access route or a frequently used area and 2,500mm from a car parking area.
- **Minimum distance of the flue terminal to a facing wall, fence, building or property boundary is 2,500mm.

Greenstar Camray series horizontal fluing options – regular (kitchen) & Utility, System (kitchen) & Utility System models

Horizontal RS flue



Flue diameter	12 to 32 models (125mm)
Minimum flue length	200mm
Maximum flue length	4,000mm

RS horizontal flue kit

Comprises:

- 1 x terminal assembly
- 1 x clamp bracket
- 1 x wall plates
- 1 x wall seal
- 1 x drill pack

Part No. 7 716 190 031

Accessories

	Worcester Part No. 125mm dia.
Flue Extension (1,000mm)	7 716 190 033
90° Bend	7 716 190 034
45° Bend (pair)	7 716 190 035
Flue Terminal Guard	7 716 190 050

The following criteria should be noted when planning the installation.

- The flue system inclines 3° (52mm per metre) from the appliance, to prevent condensation from dripping from the flue terminal.
- 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 Greenstar oil-fired series can be connected to an open or conventional flue system or a multi-directional room sealed balanced flue system.

Conventional flue

To convert the appliance to a conventional flue system the vertical flue adaptor needs to be specified:

12/18 & 18/25 models

CF flue adaptor kit

Part No. 7 716 190 036

25/32 models

CF flue adaptor kit

Part No. 7 716 190 036 and

CF adaptor

Part No. 7 716 190 065*

Extension pieces are not included in the range – proprietary flue to be used.

The flue must be constructed of materials suitable for the use of condensing combustion products.

*CF adaptor only required with other manufacturer's flue systems

Oilfit flexible flue liner kit



Greenstar Oilfit 100mm dia. flexi flue kit, 8 metre

Part No. 7 716 190 076

Greenstar Oilfit 100mm dia. flexi flue kit, 12 metre

Part No. 7 716 190 077

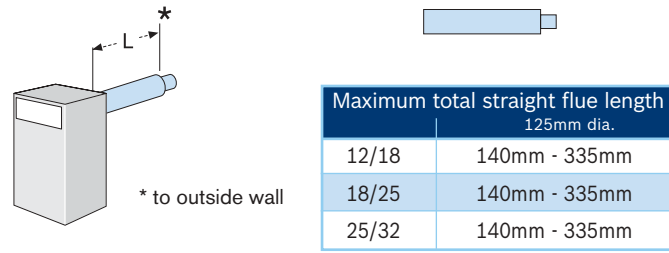
Greenstar Oilfit 100mm dia. flexi flue kit, 15 metre

Part No. 7 716 190 078

Accessories

	Worcester Part No. 100mm dia.
1,000mm Extension Kit	7 716 190 066
500mm Extension Kit	7 716 190 067
Telescopic Extension	7 716 190 068
45° Bend	7 716 190 069
Wall Cover Plate Kit	7 716 190 074

Option 1
Standard rear flue assembly

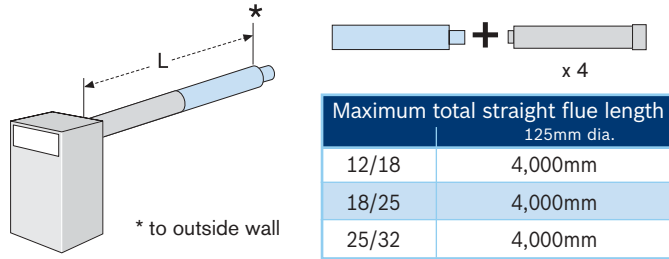


Maximum total straight flue length 125mm dia.	
12/18	140mm - 335mm
18/25	140mm - 335mm
25/32	140mm - 335mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12 to 32 models			
125mm	Standard Flue Kit	1	7 716 190 031

Notes: The flue length L is measured from the side/top of the boiler to the outside wall for the Greenstar Oilfit kits.

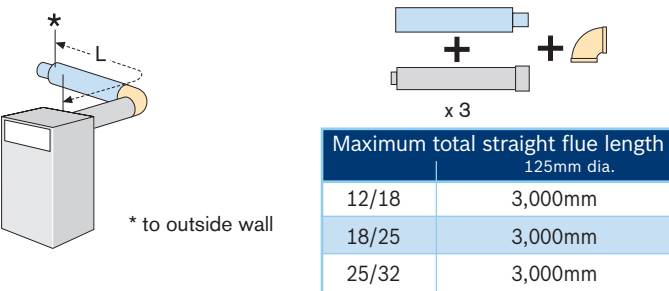
Option 2
Extended rear flue assembly



Maximum total straight flue length 125mm dia.	
12/18	4,000mm
18/25	4,000mm
25/32	4,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12 to 32 models			
125mm	Standard Flue Kit	1	7 716 190 031
125mm	Flue Extension	up to 4	7 716 190 033

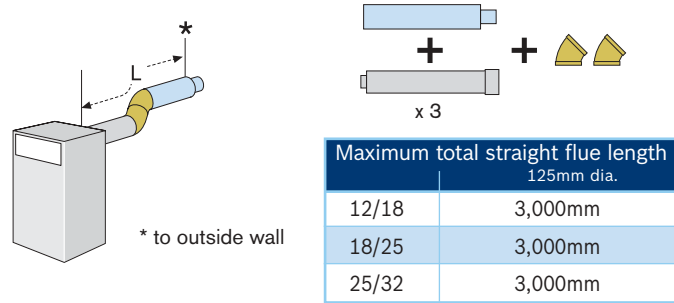
Option 3
Extended rear flue assembly with a 90° bend



Maximum total straight flue length 125mm dia.	
12/18	3,000mm
18/25	3,000mm
25/32	3,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12 to 32 models			
125mm	Standard Flue Kit	1	7 716 190 031
125mm	Flue Extension	up to 3	7 716 190 033
125mm	90° Bend	1	7 716 190 034

Option 4
Extended rear flue assembly with 45° bends

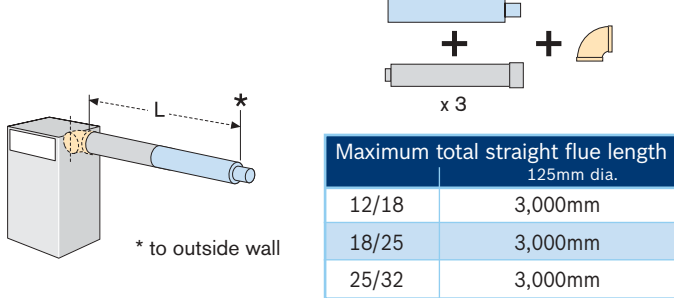


Maximum total straight flue length 125mm dia.	
12/18	3,000mm
18/25	3,000mm
25/32	3,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12 to 32 models			
125mm	Standard Flue Kit	1	7 716 190 031
125mm	Flue Extension	up to 3	7 716 190 033
125mm	45° Bend (pair)	1	7 716 190 035

Notes: The flue length L is measured from the side/top of the boiler to the outside wall for the Greenstar Oilfit kits.

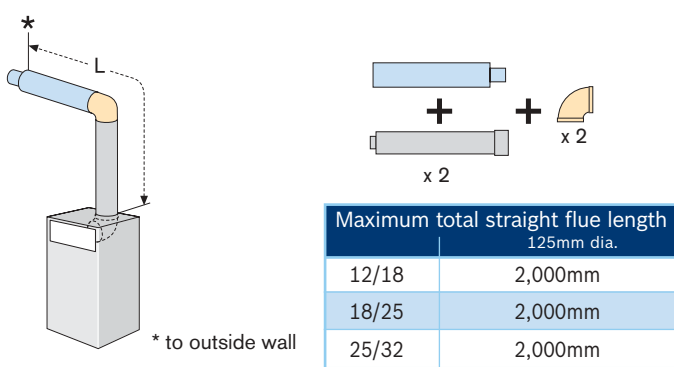
Option 5
Side flue extension



Maximum total straight flue length 125mm dia.	
12/18	3,000mm
18/25	3,000mm
25/32	3,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12 to 32 models			
125mm	Standard Flue Kit	1	7 716 190 031
125mm	Flue Extension	up to 3	7 716 190 033
125mm	90° Bend	1	7 716 190 034

Option 6
High level side discharge



Maximum total straight flue length 125mm dia.	
12/18	2,000mm
18/25	2,000mm
25/32	2,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12 to 32 models			
125mm	Standard Flue Kit	1	7 716 190 031
125mm	Flue Extension	up to 2	7 716 190 033
125mm	90° Bend	2	7 716 190 034

Greenstar Camray series vertical fluing options – regular (kitchen) & Utility, System (kitchen) & Utility System models

Vertical RS flue



Flue diameter	12/18 & 18/25 models (125mm)
Flue terminal assembly diameter	138mm
Maximum flue length (inc. terminal)	8,000mm
Flue terminal assembly length	1,020mm

Flue diameter	25/32 models (150mm)
Flue terminal assembly diameter	163mm
Maximum flue length (inc. terminal)	8,000mm
Flue terminal assembly length	1,290mm

RS vertical flue kit

Comprises:

- 1 x terminal assembly
- 1 x bend
- 1 x clamp bracket
- 1 x fire stop plate
- 1 x pipe clamp
- 1 x drill pack

Part No. 7 716 190 032

RS vertical flue kit (25/32 models only)

Comprises:

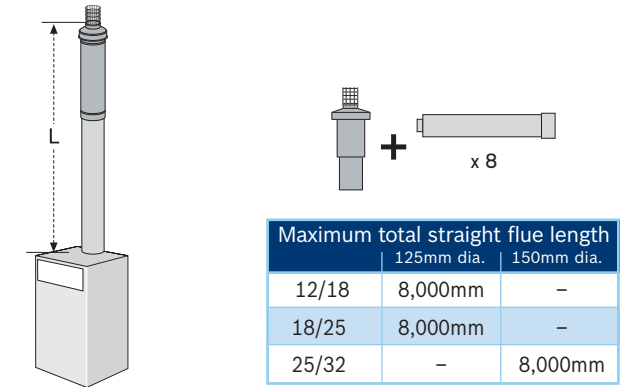
- 1 x terminal assembly
- 1 x inline 125mm dia. to 150mm dia. adaptor
- 1 x bend (125mm dia.)
- 1 x clamp bracket
- 1 x fire stop plate
- 1 x pipe clamp
- 1 x drill pack

Part No. 7 716 190 059

Accessories

	Worcester Part No.	
	12/18 & 18/25 models (125mm dia.)	25/32 models (150mm dia.)
Flue Extension (1,000mm)	7 716 190 033	7 716 190 045
90° Bend	7 716 190 034	7 716 190 046
45° Bend (pair)	7 716 190 035	7 716 190 047
Flashing – flat roof	7 716 191 090	–
Flashing – pitched roof	7 716 191 091	–

Option 1
Vertical flue system no offset

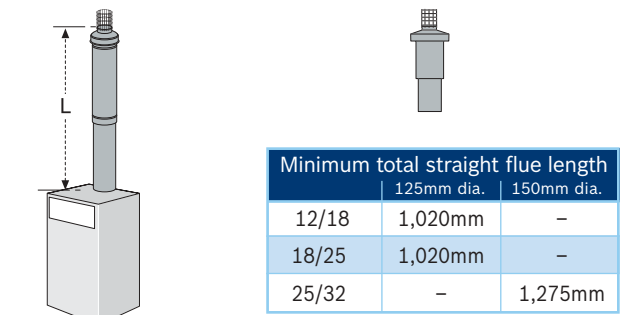


	Maximum total straight flue length 125mm dia. 150mm dia.	
	12/18	8,000mm
18/25	8,000mm	–
25/32	–	8,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12/18 & 18/25 models			
125mm	Vertical Flue Kit	1	7 716 190 032
125mm	Flue Extension	up to 8	7 716 190 033

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
25/32 models			
150mm	Vertical Flue Kit	1	7 716 190 059
150mm	Flue Extension	up to 8	7 716 190 045

Minimum height



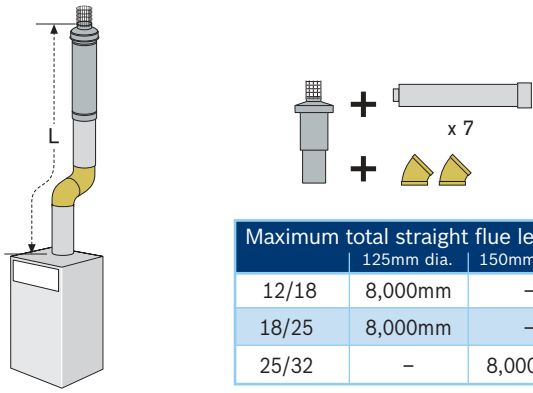
	Minimum total straight flue length 125mm dia. 150mm dia.	
	12/18	1,020mm
18/25	1,020mm	–
25/32	–	1,275mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12/18 & 18/25 models			
125mm	Vertical Flue Kit	1	7 716 190 032

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
25/32 models			
150mm	Vertical Flue Kit	1	7 716 190 059

Option 2

Vertical balanced flue system with two 45° bends



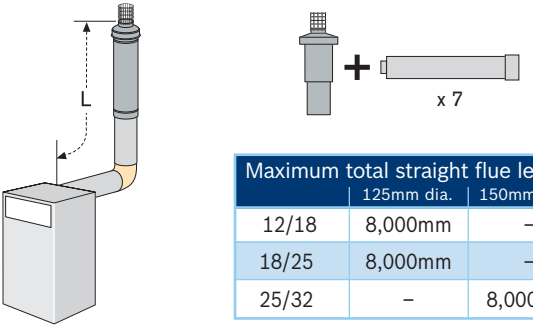
	Maximum total straight flue length	
	125mm dia.	150mm dia.
12/18	8,000mm	-
18/25	8,000mm	-
25/32	-	8,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12/18 & 18/25 models			
125mm	Vertical Flue Kit	1	7 716 190 032
125mm	Flue Extension	up to 7	7 716 190 033
125mm	45° Bend (pair)	1	7 716 190 035

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
25/32 models			
150mm	Vertical Flue Kit	1	7 716 190 059
150mm	Flue Extension	up to 7	7 716 190 045
150mm	45° Bend (pair)	1	7 716 190 047

Option 3

High level rear discharge



	Maximum total straight flue length	
	125mm dia.	150mm dia.
12/18	8,000mm	-
18/25	8,000mm	-
25/32	-	8,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
12/18 & 18/25 models			
125mm	Vertical Flue Kit	1	7 716 190 032
125mm	Flue Extension	up to 7	7 716 190 033

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
25/32 models			
150mm	Vertical Flue Kit	1	7 716 190 059
125mm	Flue Extension	up to 7	7 716 190 033

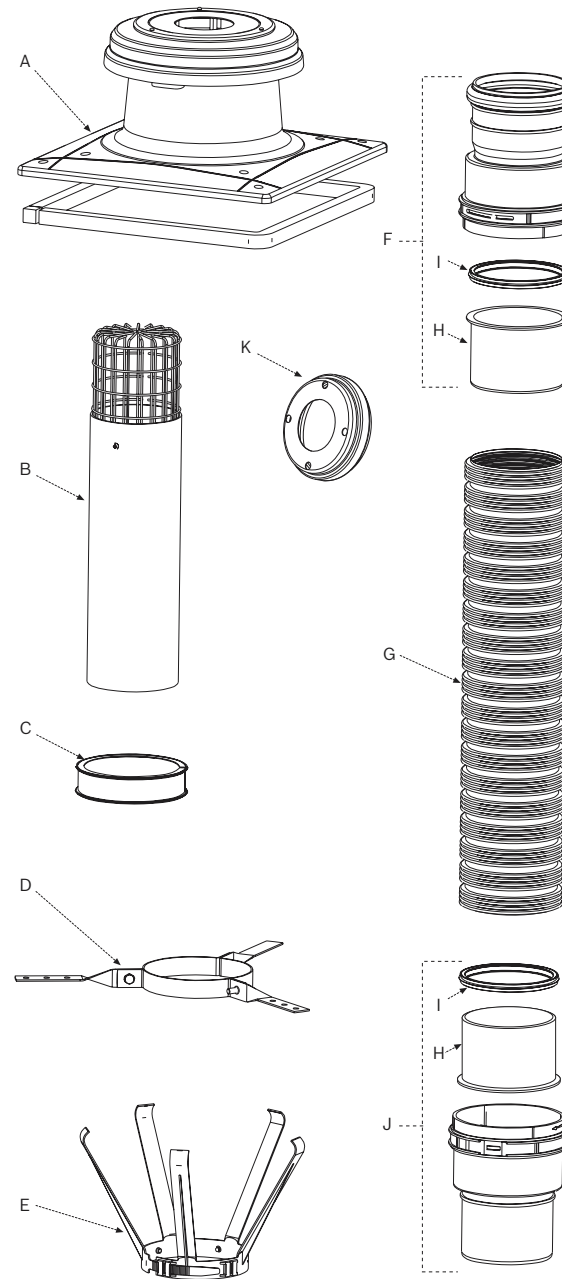
The 80/125mm to 100/150mm dia. vertical adaptors must be fitted vertically at the lowest point of the vertical section of the flue.

Oilfit conventional flexible flue liner – regular (kitchen) & Utility, System (kitchen) & Utility System models

Conventional vertical flue kit

100mm dia. CF vertical flue kit
Part No. 7 716 190 036

Conventional flexible flue liner kit



Greenstar Oilfit 100mm dia. flexi flue kit

- Comprises:
- 1 x chimney cowl (A)
 - 1 x terminal (B)
 - 1 x support collar (C)
 - 1 x support bracket assembly (D)
 - Centralising spacer (E)
 - 1 x flexible to rigid adaptor kit (F)
 - 1 x flexible liner (8m, 12m or 15m) (G)
 - 1 x liner (H)
 - 100mm dia. seal (I)
 - 1 x rigid to flexible adaptor kit (J)
 - 1 x restrictor plate (K)

Part No. 7 716 190 076 (8m)
Part No. 7 716 190 077 (12m)
Part No. 7 716 190 078 (15m)

Accessories

	Worcester Part No. 100mm dia.
1,000mm Extension Kit*	7 716 190 066
500mm Extension Kit*	7 716 190 067
Telescopic Extension*	7 716 190 068
45° Bend*	7 716 190 069
Seal	8 716 110 299 0
Wall cover plate kit	7 716 190 074

*Stainless steel

Greenstar Camray series horizontal fluing options – Oilfit external flue system

Horizontal balanced external flue



Flue diameter	80/125mm dia.	
Greenstar Camray (kitchen), (kitchen) System, Utility & Utility System series		
Maximum flue length	2,000mm*	
Greenstar Camray External series		
Maximum flue length	12/18	2,000mm*
	18/25	2,000mm*
	25/32	–

*From the boiler casing, (the horizontal kit bend is ignored when calculating the flue length).

80/125mm dia. horizontal external flue kit

Comprises:

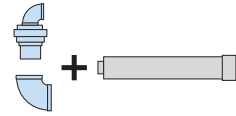
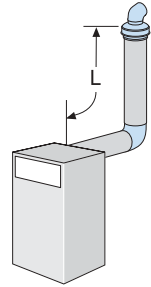
- 1 x terminal assembly
- 1 x 80/125 weather seal
- 1 x external bend
- 1 x external cabinet flue seal and plate
- 1 x clamp bracket
- 1 x drill pack

Part No. 7 716 190 057

Accessories

	Worcester Part No.	
	80/125mm dia.	100/150mm dia.
External Flue Extension	7 716 190 054	7 716 190 060
External 90° Bend	7 716 190 055	–
External 45° Bends (pair)	7 716 190 056	7 716 190 061

Horizontal terminal option



Maximum total straight flue length	
80/125mm dia.	
Camray series	2,000mm*
Camray External 12/18	2,000mm*
Camray External 18/25	2,000mm*

Flue components required

Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray, System, Utility & Utility System series			
125mm	Horizontal External Flue Kit	1	7 716 190 057
125mm	External Flue Extension	up to 2	7 716 190 054
Greenstar Camray External 12/18 & 18/25 models			
125mm	Horizontal External Flue Kit	1	7 716 190 057
125mm	External Flue Extension	up to 2	7 716 190 054

*From the boiler casing, (the horizontal kit bend is ignored when calculating the flue length).

Greenstar Camray series vertical fluing options – Oilfit external flue system

Vertical balanced external flue



Flue diameter	Maximum flue length	
	80/125mm dia.	100/150mm dia.
Greenstar Camray (kitchen), (kitchen) System, Utility & Utility System series		
Maximum flue length	12/18	8,000mm*
	18/25	8,000mm*
	25/32	–
		8,000mm*
Greenstar Camray External series		
Maximum flue length	12/18	8,000mm*
	18/25	8,000mm*
	25/32	–
		8,000mm*

*From the boiler casing, (the vertical kit bend is ignored when calculating the flue length) maximum 2m of horizontal flue.

80/125mm dia. vertical external flue kit –

Greenstar Camray (kitchen), Camray (kitchen) System, Camray Utility, Camray Utility System 12/18 & 18/25 models, Camray External 12/18 & 18/25 models,

Comprises:

- 1 x terminal assembly
- 1 x 80/125 weather seal
- 1 x external bend
- 1 x external cabinet flue seal and plate
- 1 x clamp bracket
- 1 x drill pack

Part No. 7 716 190 053

100/150mm dia. vertical external flue kit –

Greenstar Camray (kitchen), Camray System (kitchen), Camray Utility, Camray Utility System 25/32 models, Camray External 25/32 model,

Comprises:

- 1 x terminal assembly
- 1 x 100/150 weather seal
- 1 x inline external 80/125mm dia. to 100/150mm dia. adaptor
- 1 x 80/125 weather seal
- 1 x external bend
- 1 x external cabinet flue seal and plate
- 1 x clamp bracket
- 1 x drill pack

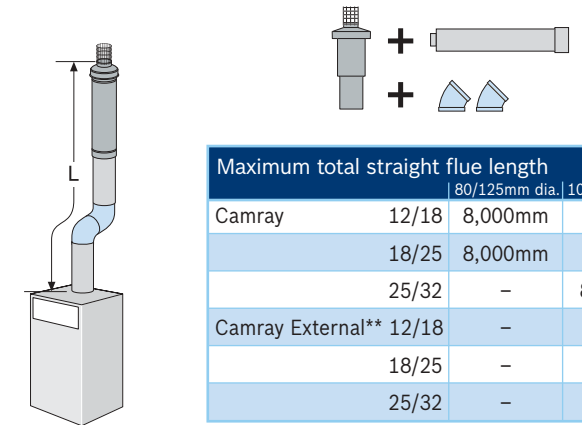
Part No. 7 716 190 058

Accessories

	Worcester Part No.	
	80/125mm dia.	100/150mm dia.
External Flue Extension	7 716 190 054	7 716 190 060
External 90° Bend	7 716 190 055	–
External 45° Bends (pair)	7 716 190 056	7 716 190 061

Option 1

Top outlet



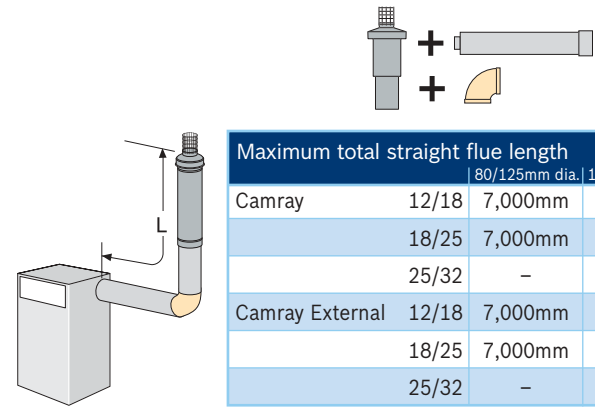
	Maximum total straight flue length		
		80/125mm dia.	100/150mm dia.
Camray	12/18	8,000mm	–
	18/25	8,000mm	–
	25/32	–	8,000mm
Camray External**	12/18	–	–
	18/25	–	–
	25/32	–	–

Flue components required

Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray 12/18 & 18/25 models			
125mm	Vertical External Flue Kit	1	7 716 190 053
125mm	External Flue Extension	up to 7	7 716 190 054
125mm	External 45° Bends (pair)	1	7 716 190 056
Greenstar Camray 25/32 models			
150mm	Vertical External Flue Kit	1	7 716 190 058
150mm	External Flue Extension	up to 7	7 716 190 060
150mm	External 45° Bends (pair)	1	7 716 190 061

**Top outlet not available on Greenstar Camray External models.
Note: For satisfactory flue performance it is recommended that no more than 2m of the vertical flue is run horizontally.

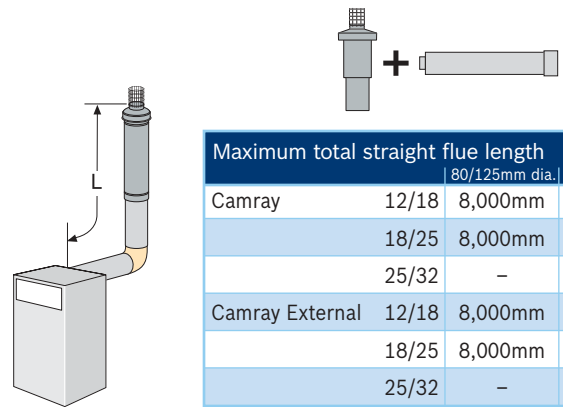
Option 2
Side outlet



Maximum total straight flue length			
		80/125mm dia.	100/150mm dia.
Camray	12/18	7,000mm	-
	18/25	7,000mm	-
	25/32	-	7,000mm
Camray External	12/18	7,000mm	-
	18/25	7,000mm	-
	25/32	-	7,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray 12/18 & 18/25 models			
125mm	Vertical External Flue Kit	1	7 716 190 053
125mm	External Flue Extension	up to 6	7 716 190 054
125mm	External 90° Bend	1	7 716 190 055
Greenstar Camray 25/32 models			
150mm	Vertical External Flue Kit	1	7 716 190 058
150mm	External Flue Extension	up to 6	7 716 190 060
Greenstar Camray External 12/18 & 18/25 models			
125mm	Vertical External Flue Kit	1	7 716 190 053
125mm	External Flue Extension	up to 6	7 716 190 054
125mm	External 90° Bend	1	7 716 190 055
Greenstar Camray External 25/32 models			
150mm	Vertical External Flue Kit	1	7 716 190 058
150mm	External Flue Extension	up to 6	7 716 190 060

Option 3
Rear outlet



Maximum total straight flue length			
		80/125mm dia.	100/150mm dia.
Camray	12/18	8,000mm	-
	18/25	8,000mm	-
	25/32	-	8,000mm
Camray External	12/18	8,000mm	-
	18/25	8,000mm	-
	25/32	-	8,000mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray 12/18 & 18/25 models			
125mm	Vertical External Flue Kit	1	7 716 190 053
125mm	External Flue Extension	up to 7	7 716 190 054
Greenstar Camray 25/32 models			
150mm	Vertical External Flue Kit	1	7 716 190 058
150mm	External Flue Extension	up to 7	7 716 190 060
Greenstar Camray External 12/18 & 18/25 models			
125mm	Vertical External Flue Kit	1	7 716 190 053
125mm	External Flue Extension	up to 7	7 716 190 054
Greenstar Camray External 25/32 models			
150mm	Vertical External Flue Kit	1	7 716 190 058
150mm	External Flue Extension	up to 7	7 716 190 060

Greenstar Camray series low-level fluing options – external models

Horizontal RS flue



Option 3

Low-level right

Low level horizontal BF kit

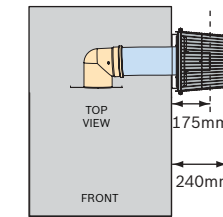
Comprises:

1 x terminal assembly

Part No. 7 716 190 052

Accessories

	Worcester Part No.
90° Bend	7 716 190 034
Flue Terminal Guard	7 716 190 050



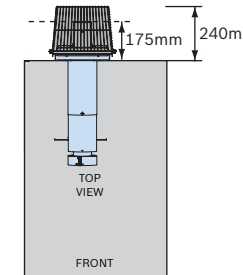
Maximum total straight flue length	
125mm dia.	
12/18	175mm
18/25	175mm
25/32	175mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray External models			
125mm	Standard Flue Kit	1	7 716 190 052
125mm	90° Bend	1	7 716 190 034*
125mm	Flue Terminal Guard	1	7 716 190 050

*Note: To flue to the left or right hand sides only

Option 1

Low-level rear

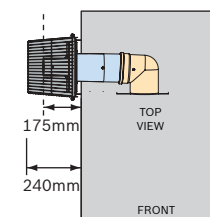


Maximum total straight flue length	
125mm dia.	
12/18	175mm
18/25	175mm
25/32	175mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray External models			
125mm	Standard Flue Kit	1	7 716 190 052
125mm	Flue Terminal Guard	1	7 716 190 050

Option 2

Low-level left



Maximum total straight flue length	
125mm dia.	
12/18	175mm
18/25	175mm
25/32	175mm

Flue components required			
Flue Diameter	Description	Quantity	Worcester Part No.
Greenstar Camray External models			
125mm	Standard Flue Kit	1	7 716 190 052
125mm	90° Bend	1	7 716 190 034*
125mm	Flue Terminal Guard	1	7 716 190 050

*Note: To flue to the left or right hand sides only

Installation requirements

Installation regulations

The appliance should be installed by a competent person. The person installing the appliance should be aware of the Health and Safety at Work Act and take appropriate action to ensure that the regulations are adhered to. In order to give optimum efficiency and trouble-free operation the appliance must be commissioned by a qualified OFTEC engineer.

The compliance with a British Standard does not, of itself, confer immunity from legal obligations. In particular the installation of this appliance must be in accordance with the relevant requirements of the following British Standards and regulations in respect of the safe installation of equipment.

BS 5410: part 1 & 2: Code of Practice for Oil Fired Boilers.

BS 799: part 5: Specification for Oil Storage Tanks.

BS 7593: Code of Practice for treatment of water in domestic hot water central heating systems.

BS 5449: part 1: Specification for forced circulation hot water central heating for domestic premises.

BS 5955: part 8: Specification for the installation of thermoplastic pipes and associated fittings for use in domestic hot and cold water services and heating systems.

BS 7291: Thermoplastic pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings.

BS 7074: part 1: Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems.

BS 7671: IEE Wiring Regulations, current edition.

The Building Regulations Part J and L1 England and Wales; Part F and Part J Section III Scotland; Part L and Part F Northern Ireland.

Local water company by-laws.

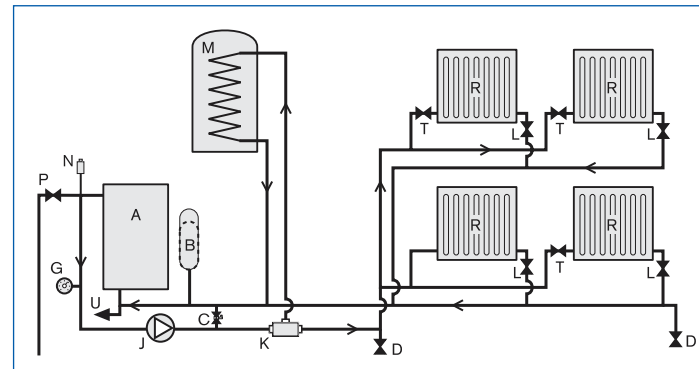
The Control of Pollution (Oil) Regulations.

OFTEC Standards

To ensure that the installation will perform to the highest standards, the system and components should conform to those mentioned in these instructions.

Fully pumped sealed primary system

- A pressure relief valve (P) (spring loaded safety valve set to operate at 3bar) must be fitted to the heating flow pipe as close as possible to the boiler.
- An expansion vessel (B) should be fitted to the heating return pipe close to the boiler and pressurised for the system volume according to the instructions supplied with the vessel.
- A pressure gauge (G) (3bar min.) must be fitted to the heating flow pipe.
- An automatic vent (N) must be fitted.



Typical sealed system

A Appliance	L Lockshield valve
B Expansion vessel	M Hot water cylinder
C Automatic bypass valve	N Automatic air vent
D Drain cock	P Pressure relief discharge
G Pressure gauge	R Radiators
J Circulating pump	T TRV
K Diverter valve	U To filling system

Plastic pipework

Plastic pipework must have a polymeric barrier.

Underfloor heating

- Plastic pipework used for underfloor heating must be correctly controlled with a thermostatic blending valve limiting the temperature of the circuits to approx. 50°C. The pipework from the boiler to the blending valve must be in copper or steel (protected from corrosion) if used in a sealed primary water system

Sealed systems

- Any plastic pipework used must have a polymeric barrier, comply with BS 7921 and installed to BS 5955 with 1,000mm (minimum) length of copper or steel pipe connected to the boiler.

Plastic pipe work used for underfloor heating must be correctly controlled with a thermostatic blending valve limiting the temperature of the circuits to approx. 50°C with 1,000mm (minimum) length of copper or steel pipe connected to the boiler.

Open vent systems

- A minimum length of 1,000mm of copper or steel pipe must be connected to the boiler after which plastic pipe can be used.

Primary system/connections/valves

- **Do not use galvanised pipes or radiators**
- All system connections, taps and mixing valves must be capable of sustaining a pressure up to 3bar
- Radiator valves should conform to BS 2767:10
- All other valves should conform to BS 1010
- On new installations Thermostatic Radiator Valves (TRVs) must be used on all radiators except the radiator where the room thermostat is sited, this must be fitted with lockshield valves and left open. All boiler replacement installations should have TRVs fitted to radiators at least within the sleeping accommodation
- To comply with Building Regulations an automatic bypass valve must be connected between the heating flow and return

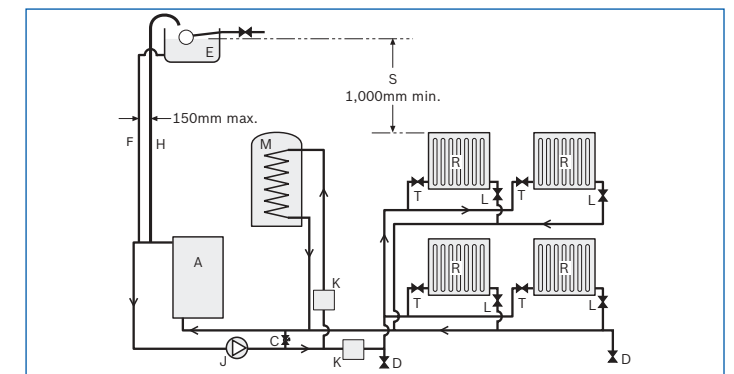
- Drain cocks are required at all the lowest points on the system
- Air vents are required at all the high points on the system.

Open vented primary systems

The feed and expansion cistern (E) must be positioned to provide a static head (S) of at least 1 metre above the highest point in the heating system to the water level in the expansion tank (E).

The open vent pipe (H), feed and expansion pipe (F) must rise continuously from the appliance.

The open vent pipe (H) must be at least 22mm dia.



Typical open vent system

A Appliance	K Zone valve
C Automatic bypass valve	L Lockshield valve
D Drain cock	M Hot water cylinder
E Feed and expansion cistern	R Radiators
F Feed and expansion 15mm dia. min	S Static head
H Open vent 22mm dia. min	T TRV
J Circulating pump	

Clearances and siting – Greenstar Camray regular (kitchen) and Utility, System (kitchen) and System Utility

The boiler does not require a constructional hearth.

The boiler should however be positioned on a non-permeable solid base. Care should be taken to ensure that the appliance is level.

The following clearances should be left for servicing, maintenance and repair:

- Above 10mm (annual service check)
- Above 300mm (maintenance and repair)
- In front 600mm
- Sides 5mm
- Below –

Note: When fitted beneath a work top, the required access for servicing and routine maintenance can be achieved by using a removable work top.

Electricity supply

The electrical connection to the boiler must allow complete isolation of the appliance, via a double pole isolator with a contact separation of 3mm in all poles supplying the boiler and controls only. A 5 amp fuse should be fitted in the mains supply.

The installation must be in accordance with the relevant requirements of the IEE Wiring Regulations.

Important: The external appliances provide a permanent external electrical supply for servicing and must therefore be fed via a circuit breaker incorporating earth leakage protection. External equipment operated at 230 volts should not be installed, serviced or repaired under adverse weather conditions.

Oil tanks

Tanks – general

Tanks should be located in the most unobtrusive position possible, however thought should always be given to the needs of safety, filling, maintenance and if necessary the provision of a head of oil above the burner.

Reference must be made to OFTEC – Technical Information note T1/133 covering the risk assessment of environmental damage being caused by spillage from oil storage tanks, this assessment must be completed by an approved OFTEC technician to establish the type of tank necessary.

There should be a minimum distance of 600mm from the tank and any foliage intended as a screen.

Oil storage installations fall into three classes – Class 1, Class 2 and Class 3.

Class 1 – are those installations where the boiler does not exceed 45kW or oil storage does not exceed 3,500 litres, these installations are covered in BS 5410 : Part 1.

Class 2 – are those installations where the boiler exceeds 45kW or the oil storage exceeds 3,500 litres, these installations are covered in BS 5410 : Part 2.

Class 3 – Large buildings and places of public entertainment or assembly.

In England, the control of pollution (oil storage) (England) regulations 2001 apply to storage over 200 litres for non domestic properties or for any installation over 3,500 litres.

These appliances would generally fall into Class 1. If the installation falls into class 2 or 3, OFTEC Book Three and technical information sheet T1/136 must be consulted.

Size of tank

It is recommended that the minimum size of tank for the Greenstar Camray boiler is 2,000 litres. However this can be adjusted accordingly to the customer's requirements.

External tank installations

Building Regulations – England and Wales

In England and Wales installations in single family dwellings must comply with Building Regulations Part J. This in turn requires compliance with BS 5410 : Part 1 and Part 2. All tanks deemed to be at risk or with a capacity of more than 2,500 litres will require a bund.

Building Regulations – Scotland

In Scotland Building Regulation part F applies. This in turn requires compliance with BS 5410 : Part 1 and Part 2. All tanks deemed to be at risk or with a capacity of more than 2,500 litres will require a bund.

Northern Ireland

In Northern Ireland the building regulations do not cover the installation of Oil storage tanks, guidance should be sought from BS 5410 : Part 1 and Part 2.

Bunds – when are they necessary?

These are 'enclosures' designed to contain spillage from the oil tank. Reference must be made to OFTEC – Technical information note T1/133 covering the risk assessment of environmental damage being caused by spillage from oil storage tanks to determine if a bund is required.

There are two main ways to comply if a bund is required:

1. Bunded tanks – are now the most popular way in which to meet the standards and regulations if a bund is required, these tanks are in essence a 'tank within a tank' which prevent leakage from the inner 'oil' tank escaping into the environment by containing it in the outer tank. The use of these tanks avoids the work of constructing a masonry or concrete wall bund as in point 2.

Integrally bunded plastic tanks must comply to OFTEC Standard OFS T100 and integrally bunded steel tanks must comply to OFTEC standard OFS T200. Both must have an OFCERT license to show compliance.

2. External bunds are masonry or concrete enclosures built around a single skinned plastic or steel tank and lined with an oil resistant material to contain the spillage. The bund must be constructed to CIRIA report 163.

Both of these bunds must be capable of holding 110% of the contents of the tank in the event of a leak or spillage during filling.

The following criteria must be considered before choosing the type of oil tank and its location:

British Standard 5410 : Part 1 does not require tanks installed externally to be fitted with a bund unless its absence creates a hazardous situation. OFTEC has published a risk assessment form T1/133, which lists the requirements to be met if the tank is not to be fitted with a bund. The risk assessment must be completed in all cases. The assessment must be completed by an OFTEC approved technician. The below situations would require the provision of a bund in all cases:

1. Tank capacity in excess of 2,500 litres.
2. Tank sited less than 10 metres from controlled water.
3. Tank sited where spillage could run off into an open drain or to a loose fitting manhole cover.
4. Tank within 50 metres of a borehole or spring.

5. Tank on hard surfaced ground that could enable spillage run off to reach controlled water.
6. Tank sited in a position where the vent pipe outlet is not visible from the filling point.
7. Tank supplying heating oil to a building other than a single family dwelling.
8. Any other potential hazard individual to the site.

Internal tank installations

Always inform the local Fire Officer and Insurers of any internal installations.

Oil tanks installed internally must never be sited in a habitable area and must be within an enclosed chamber. This chamber comprises a fully enclosed ventilated space and must have 60 minute fire resistant wall, floor, door and roof with a self closing door that opens outwards. The door must be able to be opened from the inside without the aid of a key. The chamber must act as a bund so the door must open above the top level of any constructed bund. If the use of an internally bunded tank is made then the chamber only has to provide the correct fire protection, the door can be at floor level. The chamber must be vented directly to open atmosphere. Space for access to the tank in the chamber must be provided. In the case of steel tanks adequate space for painting and maintenance is required. Any electrical lighting should be of the bulk head type with switches mounted externally.

Oil storage tanks may be installed in a garage but the guidance in OFTEC Technical sheet T1/127 must be followed.

Underground tank installations

All underground oil storage tanks must be fitted with overflow protection.

In all cases the potential buoyancy of the tank should be considered if the water table in the area can rise above the level of the oil in the tank.

Underground installation can be located closer than 1,800mm to an adjacent building and 760mm to a boundary without additional protection.

All underground tanks must be specially constructed to withstand the pressures placed upon them by the surrounding ground. GRP tanks in either single or double skinned versions are suitable, Polyethylene models are also suitable. If steel tanks are used they must be of the double skinned type.

Steel tanks

Steel tanks are available but are being out dated by maintenance free plastic tanks due to their need for siting on piers and painting.

They must be positioned with a slight back fall away from the oil outlet (40mm per metre) to the drain/sludge cock at the opposite end to enable any water or sludge to be drain out of the tank.

Steel tanks should be constructed to comply with OFTEC Standard OFS T200 and must be covered by an OFCERT license.

Galvanised steel tanks and pipework should never be used in oil storage or supply.

Plastic tanks

Plastic tanks do not require painting and can be sited directly onto the ground (no need for piers) as they do not suffer from corrosion, although the head of oil above the boiler's burner should always be considered and access for cleaning the oil filter and water trap be available.

Plastic tanks should be constructed to OFTEC Standard OFS T100 and must be covered by an OFCERT license.

Position in relation to buildings and boundaries

The position of the oil storage tank relative to buildings and boundaries needs consideration in terms of fire protection, the storage tank itself does not constitute a fire hazard but needs protection from a fire which may originate nearby. For Class 1 installations, as mentioned earlier, no special fire protection is needed if the tank is situated more than 1,800mm away from the building and not less than 760mm from the site boundary.

Figs. 1 to 6 (see page 37) illustrate the requirements of a Class 1 tank installation in relation to buildings (combustible wall and non combustible wall) and boundaries (combustible and non combustible).

Oil supply

All oil burners on Worcester floor standing appliances are supplied with a single flexible fuel line from the oil pump which the installer connects the main oil supply line to (via the oil isolation valve), within the appliance. This enables the burner to be removed without the need for disconnection of the fuel line.

The maximum permissible head is 4 metres. If the head is greater, then a head breaking device must be incorporated into the oil supply line.

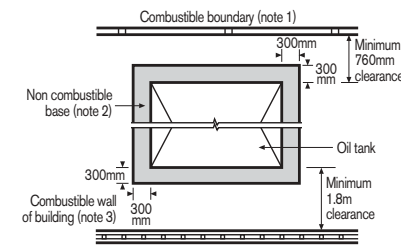
The oil pump's primary job is to pressurise the oil once in the pump and force it out of the nozzle at high pressure to atomise the fuel to ensure clean and efficient combustion. This same pump can also be converted to 'draw' up the fuel line in cases where the oil tank is lower than the appliance's burner. This conversion is undertaken by the installing engineer.

All oil pumps on Worcester appliances can easily be converted to work on a two pipe system (details of this operation are within the Installation and Servicing instructions which come with the appliance).

More advice on fuel lines can be sought from OFTEC Book Three and Technical sheet T1/134.

Fig. 1 Tank installation near combustible buildings & boundaries.

Clearances required when additional protection is not provided.



NOTES: Relevant to Fig. 1

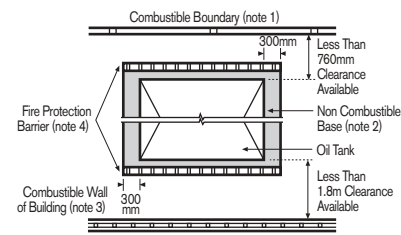
1. Combustible Boundary (has less than 30 minutes fire resistance)
2. Non Combustible Base. Covers area beneath tank and extends 300mm outside the tank on all sides except:
3. Combustible Wall of Building (has fire resistance of less than 30 minutes to internal fire)

Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)

Where the tank is located over an existing non combustible surface

Fig. 2 Tank installation near combustible buildings & boundaries

Protection required where clearances in Fig. 1 are not provided.



NOTES: Relevant to Fig. 2

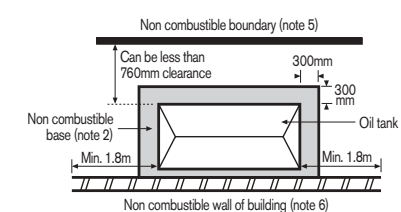
1. Combustible Boundary (has less than 30 minutes fire resistance)
2. Non Combustible Base. Covers area beneath tank and extends 300mm outside the tank on all sides except:
3. Combustible Wall of Building (has fire resistance of less than 30 minutes to internal fire)
4. Fire Protection Barrier (Non combustible, minimum fire resistance of 30 minutes, extends 300mm beyond both ends of tank and 300mm higher than the tank)

Where the tank is located over an existing non combustible surface

Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)

Fig. 3 Tank installation near non combustible buildings & boundaries

Building wall without openings. No added protection required.



NOTES: Relevant to Fig. 3

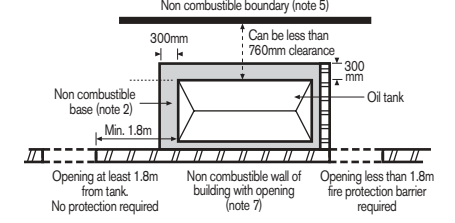
2. Non Combustible Base. Covers area beneath tank and extends 300mm outside the tank on all sides except:
5. Non combustible boundary (has minimum fire resistance of 30 minutes). Must extend 300mm higher than the tank and 300mm beyond both ends of the tank.
6. Non Combustible Wall of Building (has minimum fire resistance of 30 minutes). Any part of the wall within 1.8m of the tank must have a fire resistance to internal fire of not less than 30 minutes and have no openings other than airbricks.

Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)

Where the tank is located over an existing non combustible surface

Fig. 4 Tank installation near non combustible buildings & boundaries

Building wall with openings. Opening protection required.



NOTES: Relevant to Fig. 4

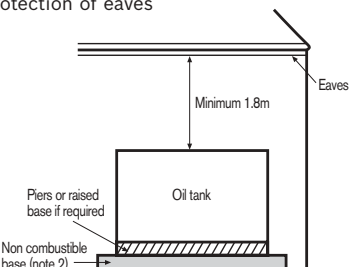
2. Non Combustible Base. Covers area beneath tank and extends 300mm outside the tank on all sides except:
4. Fire Protection Barrier (Non combustible, minimum fire resistance of 30 minutes, extends to non combustible wall, 300mm beyond both ends of tank and 300mm higher than the tank)
5. Non combustible boundary (has minimum fire resistance of 30 minutes). Must extend 300mm higher than the tank and 300mm beyond both ends of the tank.
7. If wall has openings closer than 1.8m to tank then a fire protection barrier 300mm higher than the tank and 300mm beyond the tank can be fitted. The non combustible building wall and the barrier must protect the tank from fire coming through the opening.

Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)

Where the tank is located over an existing non combustible surface

Fig. 5 Tank installations under eaves

Without protection of eaves



NOTES: Relevant to Fig. 5

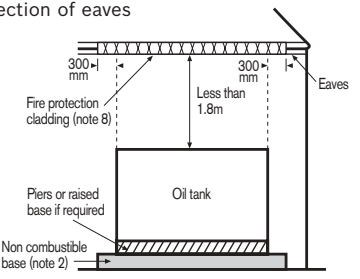
2. Non Combustible Base. Covers area beneath tank and extends 300mm outside the tank on all sides except:
- Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)
- Where the tank is located over an existing non combustible surface

Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)

Where the tank is located over an existing non combustible surface

Fig. 6 Tank installations under eaves

With protection of eaves



NOTES: Relevant to Fig. 6

2. Non Combustible Base. Covers area beneath tank and extends 300mm outside the tank on all sides except:
8. Fire protection to combustible eaves (must provide a minimum resistance to fire of 30 minutes, extends the length of the eaves over the tank with an additional 300mm at both ends). The cladding of the eaves is to prevent fire spreading to the roof from the area of the tank.

Where the tank is next to a non combustible wall (minimum 30 minutes fire resistance)

Where the tank is located over an existing non combustible surface

For more information refer to BS 5410 : Part 1, OFTEC Book Three and Technical sheet T1/131.

De-aeration devices

A de-aeration device is a container of oil about the size of a pint glass with an automatic air vent on top and three connections on the bottom. It saves running a return oil pipe back to the tank from the burner as in Fig.11. Its function is to provide a reservoir of oil from which the oil pump draws oil whilst venting any air in the oil to the atmosphere preventing nuisance 'lockout' of the burner. Not all the oil drawn is consumed and any excess is returned to the de-aeration device, so whilst the burner is firing there is a continuous flow and return of oil. The third connection is for the main fuel line from the oil tank. There is usually a non-return valve located in this connection to prevent oil draining back towards the oil tank under gravity and creating a vacuum. When the burner is firing the whole fuel supply system is under negative pressure i.e. suction, therefore it is imperative that all joints on the fuel supply system are sound. Whilst there may be no obvious signs of an oil leak externally, when the burner is firing it may be possible for air to be drawn in through a bad joint, reducing the pump's capabilities, resulting in a lack of fuel to the oil pump and nuisance 'lockout'. This may manifest itself as a very low level of oil or 'foaming' of the oil inside the de-aeration device whilst the burner is trying to fire.

Most de-aeration devices are made of plastic and vent to the atmosphere. For this reason they must always be located externally, if sited internally they would constitute a fire hazard (see Fig. 12).

Metal types do exist which do not emit vapour. These can be located internally or externally. Plastic pipe specifically for oil lines does exist and is acceptable but must only be used underground.

Top outlet oil tanks should have the non return valve removed from the end of the oil feed pipe within the tank if installed in conjunction with a de-aeration device.

Supply pipe

The oil supply pipe itself would normally be annealed copper tube with a protective plastic coating which is easily manipulated around bends and usually enables the fuel line to be run in a continuous length without joints. If joints must be used, they must be accessible, even if underground (via an access duct) and should be of the manipulative type. Plastic pipe specifically for oil lines does exist and is acceptable but must only be used underground.

Galvanised pipe, fittings and soldered joints must not be used in oil lines.

More advice on fuel lines can be sought from OFTEC Book Three and Technical sheet TI/134.

Supply pipe sizing

The diameter of the oil supply pipe itself is subject to the distance from the oil tank to the appliance and the head of oil whether it be positive or negative.

Tables 1 and 2 give the required diameter of supply pipe when cross referenced with the head. Table 3 gives the diameter of the supply pipe when the use of a de-aeration device is made.

Table 1 Single pipe gravity feed system

Maximum allowable pipe run (metres)		
Head (m)	8mm inside dia. pipe (10mm OD copper)	10mm inside dia. pipe (12mm OD copper)
0.5	12	30
1.0	25	69
1.5	37	91
2.0	49	100
2.5	62	100
3.0	74	100
3.4	87	100
4.0	99	100

Table 2 Double pipe sub-gravity feed system

Maximum allowable pipe run (metres)		
Head (m)	8mm inside dia. pipe (10mm OD copper)	10mm inside dia. pipe (12mm OD copper)
0	50	100
-0.5	44	100
-1.0	38	95
-1.5	32	80
-2.0	26	66
-2.5	20	51
-3.0	14	37
-3.5	8	22

Table 3 Single pipe suction lift with de-aerator

Maximum allowable run from tank to de-aerator (metres)	
Fuel flow rate	2.5(kg/h)
Head (m)	6mm inside dia. pipe (8mm OD copper)
0	100
0.5	95
1.0	80
1.5	70
2.0	60
2.5	45
3.0	35
3.5	25

Oil filters

Oil filters must always be incorporated in the oil supply line, one on the outlet from the oil tank to filter deposits from within the tank or fuel and one near the appliance to filter deposits from within the fuel line itself. They are supplied and fitted by the installing engineer and are not part of the boiler's components. They should be able to be serviced without the need for draining down the fuel supply line. There must be sufficient clearance below the filter to enable servicing operations to be carried out easily. Filters must comply to OFTEC standard OFS E104.

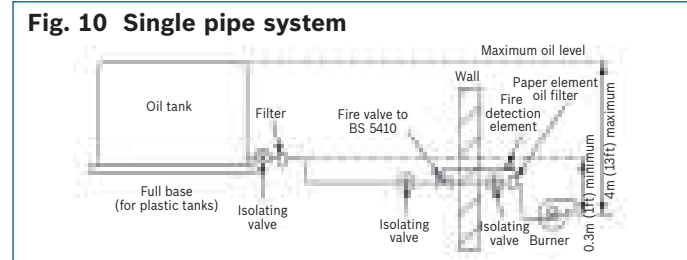
Fire valves

A fire valve is an essential part of the oil supply system. It is supplied and fitted by the installing engineer and is not part of the boiler's components. Its purpose is to cut off the flow of oil outside the building in the event of fire within the boiler area. The valve should be located at the point of entry into the building of the fuel line. For external versions the fire valve must be at least one metre from the casing. It must be activated by a remote sensor located over the burner. A clip is provided within the appliance for the sensor. Fire valves must comply with OFTEC standard OFS E101.

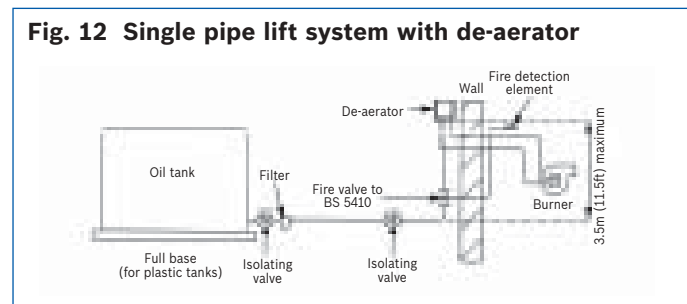
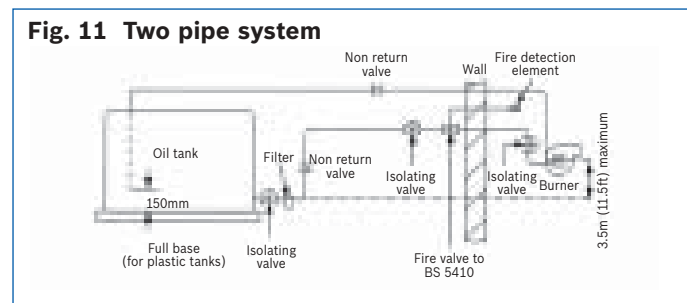
Warranty

Worcester oil-fired appliances are offered with a 2 year* guarantee on parts and labour from the date of installation if the appliance is commissioned upon installation and the regular service requirements are met. The primary heat exchanger comes with a 5 year* warranty. Ongoing service and maintenance contracts can be arranged through the Worcester Customer Service Department.

*Subject to conditions.



Two pipe systems



Greenstar Camray series accessories – regular (kitchen) & Utility, System (kitchen) & Utility System models

Horizontal flue kit (125mm dia.)



Worcester Part No. 7 716 190 031

Horizontal flue kit (150mm dia.)



Worcester Part No. 7 716 190 043

Vertical flue kit (125mm dia.)




Worcester Part No. 7 716 190 032

Vertical flue kit (150mm dia.)



Worcester Part No. 7 716 190 044

Digital plug-in 7 day twin channel programmer (kitchen models only)



Worcester Part No. 7 716 192 033

Stainless steel flue terminal guard



Worcester Part No. 7 716 190 050

Stainless steel flue terminal guard



Worcester Part No. 7 716 190 051

Flat roof flashing kit (125mm dia.)



Worcester Part No. 7 716 191 090

Vertical flue kit (150mm dia.) (25/32 models)



Worcester Part No. 7 716 190 059

Telescopic flue kit short (125mm dia.)



Worcester Part No. 7 716 190 062

Telescopic flue kit standard (125mm dia.)



Worcester Part No. 7 716 190 064

Flue extension (125mm dia.)



Worcester Part No. 7 716 190 033

Pitched roof flashing kit (125mm dia.)



Worcester Part No. 7 716 191 091

Oilfit flexible flue kit



Worcester Part No. 100mm dia. 7 716 190 076

1,000mm extension kit



Worcester Part No. 100mm dia. 7 716 190 066

500mm extension kit



Worcester Part No. 100mm dia. 7 716 190 067

Flue extension (150mm dia.)



Worcester Part No. 7 716 190 045

45° bend (125mm dia.)



Worcester Part No. 7 716 190 035

45° bend (150mm dia.)



Worcester Part No. 7 716 190 047

90° bend (125mm dia.)



Worcester Part No. 7 716 190 034

Telescopic extension



Worcester Part No. 100mm dia. 7 716 190 068

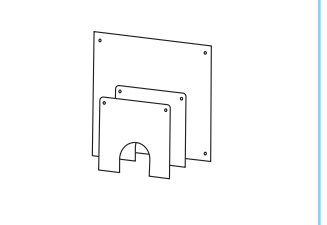
**100mm dia. 7 716 190 076 (8m)
7 716 190 077 (12m)
7 716 190 078 (15m)**

45° bend



Worcester Part No. 100mm dia. 7 716 190 069

Wall cover plate kit



Worcester Part No. 100mm dia. flue 7 716 190 074

90° bend (150mm dia.)



Worcester Part No. 7 716 190 046

Conventional flue adaptor kit




Worcester Part No. 7 716 190 036

Conventional flue adaptor (32/50 & 50/70 models)



Worcester Part No. 7 716 190 049

Conventional flue adaptor (25/32 models)*



Worcester Part No. 7 716 190 065

Horizontal external flue kit (125mm dia.)



Worcester Part No. 7 716 190 057

Vertical external flue kit (125mm dia.)



Worcester Part No. 7 716 190 053

Vertical external flue kit (150mm dia.)



Worcester Part No. 7 716 190 058

Balanced flue extension (125mm dia.)

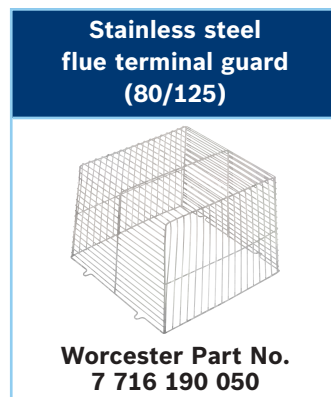


Worcester Part No. 7 716 190 054

*Adaptor only required for other manufacturer's flue systems



Greenstar Camray series accessories – external models



Greenskies FKC and FKT series – the next generation of solar panels



both oil and gas, which require a separate cylinder for the storage of hot water. When used together a Greenstar boiler with solar system provides a highly efficient heating and hot water system.

A typical well sized solar system should provide around 50-70% of the domestic hot water requirements of a home, representing a very worthwhile saving on hot water heating costs. The remaining hot water requirement is provided by the boiler.

For more information refer to the Greenskies Technical and Specification brochure (part no. 8 716 110 080) or visit www.worcester-bosch.co.uk/solar

Greenskies solar kits now available to order



For added convenience Greenskies solar systems are now available to order as complete kits. Each kit contains 2 solar panels, solar pump station, solar controller and all of the parts required for installation. The following kits are available:

If your central heating system provides a store of hot water in a cylinder, Greenskies from Worcester is very good news – because it means you now have the opportunity to make significant savings on your water heating bills. Greenskies solar water heating can supply 50-70% of the hot water you use every year. The remaining portion of your hot water demand will be provided by your central heating boiler in the normal way. Installing Worcester Greenskies solar panels provides immediate savings on your fuel bills and major benefits to the environment.

Greenstar Camray condensing boilers are compatible with Greenskies solar water heating systems to enable households to take advantage of renewable and sustainable energy. Worcester Greenskies Solar Panels harness the power in both direct and diffused sunlight and convert the energy to heat for the production of hot water for the home.

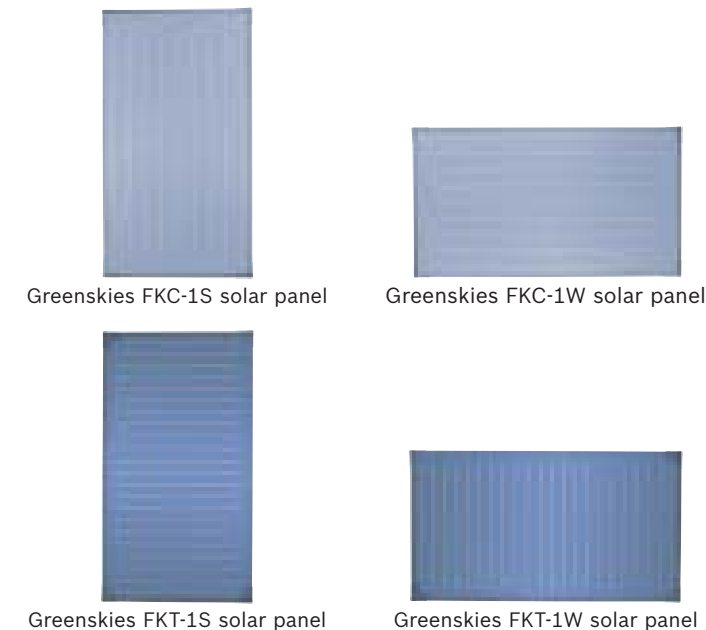
The solar panels have been designed as a complement to existing heating systems which use a store of hot water in a cylinder. The existing cylinder is exchanged for a cylinder with two heat exchanger coils; one from the boiler in the property and a second from the solar panels.

Worcester Greenskies solar panels are an ideal partner to the new range of high efficiency Greenstar condensing regular and system boilers, with different models available in

- FKC-1S standard 2 panel portrait kit on roof
Part number: 7 716 150 000
- FKC-1S standard 2 panel portrait kit in roof
Part number: 7 716 150 001
- FKC-1W standard 2 panel landscape kit on roof
Part number: 7 716 150 002
- FKC-1W standard 2 panel landscape kit in roof
Part number: 7 716 150 003
- FKT-1S high 2 panel portrait kit on roof
Part number: 7 716 150 004
- FKT-1S high 2 panel portrait kit in roof
Part number: 7 716 150 005
- FKT-1W high 2 panel landscape kit on roof
Part number: 7 716 150 006
- FKT-1W high 2 panel landscape kit in roof
Part number: 7 716 150 007

Technical data – Worcester Greenskies solar panel series

Model	Greenskies FK-1S Solar Panel	Greenskies FK-1W Solar Panel	Greenskies FK-1S Solar Panel	Greenskies FK-1W Solar Panel
Orientation	Portrait	Landscape	Portrait	Landscape
Height (mm)	2,070	1,145	2,070	1,145
Width (mm)	1,145	2,070	1,145	2,070
Depth (mm)	90	90	90	90
Gross collector area (m ²)	2.37	2.37	2.37	2.37
Aperture area (m ²)	2.25	2.25	2.25	2.25
Absorber area (m ²)	2.23	2.23	2.23	2.23
Solar glass transmission (%)	91.5	91.5	91.5	91.5
Stagnation temperature (°C)	188	188	202	202
Fluid content (litres)	0.86	1.25	1.43	1.76
Weight empty (kg)	41	42	44	45
Coating	Highly selective (black chrome)	Highly selective (black chrome)	Highly selective (PVD)	Highly selective (PVD)
Absorption	95% ± 2%	95% ± 2%	95% ± 2%	95% ± 2%
Emission	12% ± 2%	12% ± 2%	5% ± 2%	5% ± 2%
Max. operation pressure (bar)	6	6	10	10
Nominal flow rate (litres/hr)	50	50	50	50
Glass	3.2mm solar safety glass, 91.5% ± 0.5% solar transmission	3.2mm solar safety glass, 91.5% ± 0.5% solar transmission	3.2mm solar safety glass, 91.5% ± 0.5% solar transmission	3.2mm solar safety glass, 91.5% ± 0.5% solar transmission
Frame	UV and weatherproof fibre glass profile with plastic corner	UV and weatherproof fibre glass profile with plastic corner	UV and weatherproof fibre glass profile with plastic corner	UV and weatherproof fibre glass profile with plastic corner
Rear panel	0.6mm aluminium-zinc coated steel sheet	0.6mm aluminium-zinc coated steel sheet	0.6mm aluminium-zinc coated steel sheet	0.6mm aluminium-zinc coated steel sheet
Insulation	55mm mineral wool, high temperature resistant	55mm mineral wool, high temperature resistant	55mm mineral wool, high temperature resistant	55mm mineral wool, high temperature resistant
Fluid for solar circuit	Water-propylene glycol mixture 50/50	Water-propylene glycol mixture 50/50	Water-propylene glycol mixture 50/50	Water-propylene glycol mixture 50/50
Absorber	Copper strip absorber with harp hydraulic, ultrasonic welded	Copper strip absorber with harp hydraulic, ultrasonic welded	Copper strip absorber with double meander hydraulic, ultrasonic welded	Copper strip absorber with double meander hydraulic, ultrasonic welded
Certificates	CE Solar Keymark	CE Solar Keymark	CE Solar Keymark	CE Solar Keymark
Zero-loss collector efficiency	77	77	80.3	80.3
Heat loss coefficient	3.681	3.681	3.56	3.56



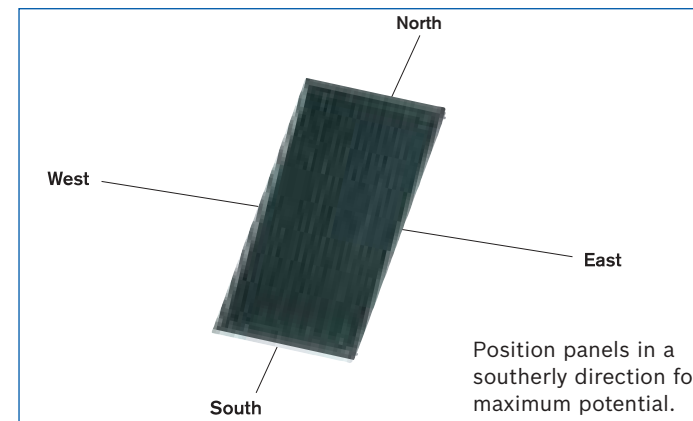
Features	Benefits
Efficient collector with 95% absorption rate	Increases performance of panel
Robust panel design	Minimises risk of damage and prolongs service life
Environmentally friendly	All materials recyclable, environmentally conscious manufacture
Quick fitting	Labour and money saving
Easy to fit	Reduces complexity of installation
Simple to use controller	Allows quick setting of functions
Selective coating on absorber	Increases collector performance even on cloudy days
Strong solar glass cover	Protects collector from damage
Larger absorber surface*	Better performance
Lower lift weight*	Easier handling

*Compared to FK240 panel

Operation

Worcester Greenskies solar panels form part of a system which remains separate from the boiler heating system.

The panels are mounted on a surface which is selected for its exposure to sunlight and usually connected, via pipe work, to the lower coil of a twin-coil solar cylinder. The energy in the sun's rays is absorbed by the panel and the heat is transferred into the pipe work in the absorber plates. The pipe work is filled with a ready-mixed liquid, containing glycol and water, which is circulated by a pump to the coil in the hot water cylinder. The heat is deposited in the storage cylinder and the glycol returns to the panel to absorb more free solar energy. The system is equipped with a simple unit to control the flow of energy from the panels to the storage cylinder.



Solar radiation in the British Isles

Contrary to popular belief the amount of solar radiation received by the UK is enough for solar water heating to be a viable supplement to existing domestic water heating. Perhaps surprisingly the UK receives 65% of the amount of solar radiation that is received by the south of Spain. The radiation in the UK is made up of direct radiation on sunny days, which accounts for around 40%, and diffused radiation on cloudy days, accounting for 60% of the total.

Summer will provide the largest amount of radiation over the year but a useful contribution will be provided in other seasons.

As an indication, a well sized typical installation will provide the following proportion of the household domestic hot water requirement:

% of requirement fulfilled by solar	
Season	%
Summer	80 - 90
Spring & Autumn	40 - 50
Winter	20 - 30

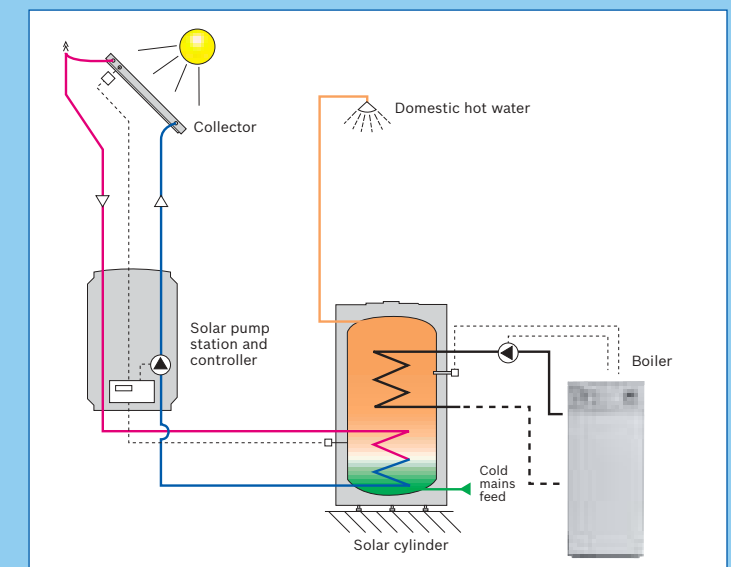
This translates to over half of the typical annual domestic hot water requirement.

Typical solar system for hot water with twin coil cylinder and conventional boiler

The most common solar system layout uses a twin coil cylinder which is fed by both a boiler (or other heat source) and the solar panels. The solar system and the regular heating system do not come into direct contact with each other and the only shared part is the cylinder.

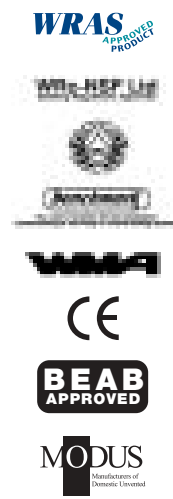
The solar system has its own pump, expansion vessel, pressure relief valve, air vent and controller.

The Worcester solar package is ideally suited for use with Worcester oil or gas-fired regular or system boilers.



Worcester Greenskies Cylinder series

Notes



Features

Inlet control set (pressure reducing valve, strainer, non-return valve and expansion relief valve).
Temperature & pressure relief valve.
15mm/22mm Tundish.
Expansion vessel 18 litre or expansion vessel 24 litre.
Wall mounting bracket (for the expansion vessel).
22mm DZR compression connections.
1 x 15mm end feed tee.
Expansion valve (to discharge).
Expansion vessel hose.
Immersion heater with thermostat and thermal cut out.
2 x two port valves.
Wiring centre.
Pockets for thermostat points.
1 x dual thermostat and 1 x high limit thermostat.

Greenskies cylinders are WRAS and BBA approved products to meet G3 Building Regulations.
 Only for use with one fossil fuel appliance and one solar system (the use of two fossil fuel appliances is not permitted)

Worcester Greenskies Cylinders are Indirect Unvented Twin Coil Solar Cylinders. These cylinders can be used in various applications, however, in Worcester's case they are to be used in conjunction with the Greenskies Solar Package. Solar heat is fed in via the lower coil, with the boiler feeding the upper coil.

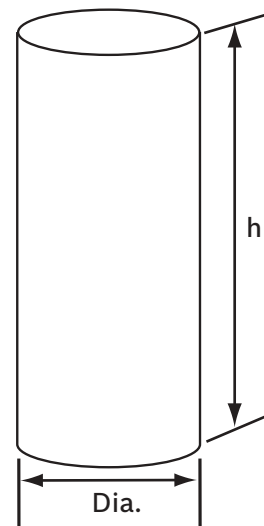
Product size (mm)

Greenskies 180 Cylinder – 1281(h) x 550(dia.)

Greenskies 210 Cylinder – 1469(h) x 550(dia.)

Greenskies 250 Cylinder – 1719(h) x 550(dia.)

Greenskies 300 Cylinder – 2032(h) x 550(dia.)



Technical data – Worcester Greenskies Cylinder series

Greenskies Cylinder technical details				
	180	210	250	300
Height (mm)	1,281	1,469	1,719	2,032
Diameter (mm)	550	550	550	550
Capacity (litres)	180	210	250	300
Weight empty (kg)	50	55	60	65
Weight full (kg)	230	265	310	365

Greenskies Cylinder product range	
Product name	Part number
Greenskies 180 Cylinder	7 716 192 554
Greenskies 210 Cylinder	7 716 192 555
Greenskies 250 Cylinder	7 716 192 556
Greenskies 300 Cylinder	7 716 192 557

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 Contact Centre for further details.

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

Tel: 08457 256 206
Fax: 01905 757 536

Opening Times

Monday – Friday: 7.00am – 8.00pm
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. You can find a spares stockist on our website.

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 answers to queries of a technical nature across the entire Worcester range.

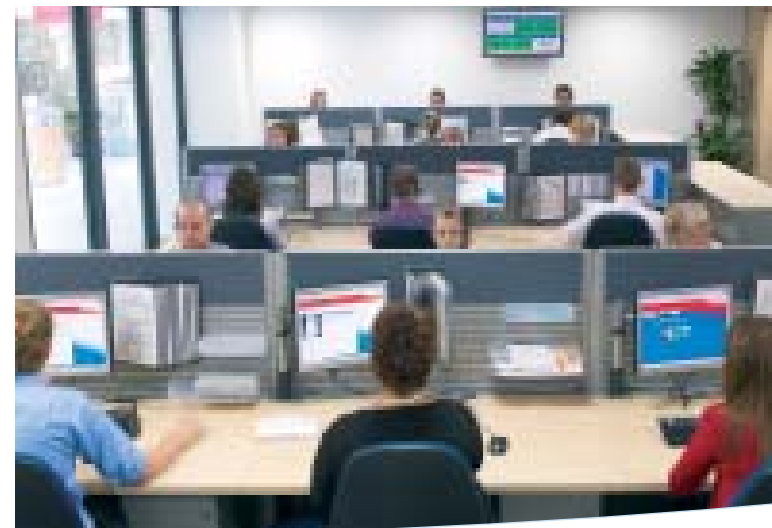
Worcester also has a pre-sales department, which provides assistance in selecting a boiler system to suit a particular application, along with full guidance on installation. As well as this we will also assist in finding a recommended installer. For more information please contact the Technical Helpline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

Worcester has produced a selection of Distance Learning CD ROMs/DVDs which are packed with information. Call 01905 752556 for your copies, or visit www.worcester-bosch.co.uk for information on Web Based Learning.

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.

Courses on Air to Water and Air to Air are now available please check with your local Technical Sales Manager and the Worcester website www.worcester-bosch.co.uk. Phone 01905 752526 to book your place.

Get on course for a more profitable future now.

Call now for more information
01905 752526



www.worcester-bosch.co.uk



Worcester training courses

Worcester training courses	
Greenstar CDi and Highflow CDi gas-fired condensing combi boilers	
Models covered	Greenstar 27/30/37/42CDi Greenstar Highflow 440/550CDi
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 FS 30/42CDi Regular Greenstar 30CDi System Greenstar 12/24i System
Duration	1 day
Greenstar Camray high efficiency condensing oil-fired boilers	
Models covered	Greenstar Camray (kitchen) Greenstar Camray System (kitchen) 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 Ground Source Heat Pumps	
Covering	Installation, Commissioning and System Design
Duration	2 days
Greenstore Heat Pumps – Air to Water	
Covering	Installation, Commissioning and System Design
Duration	2 days
Greenstore Heat Pumps – Air to Air	
Covering	Installation, Commissioning and System Design
Duration	1 day



Useful numbers

Sales

Tel: 01905 752640

Fax: 01905 456445

Spares Parts

Tel: 01905 752576

Fax: 01905 754620

Technical (Pre & Post Sales)

Tel: 08705 266241

Fax: 01905 752741

Service

Tel: 08457 256206

Fax: 01905 757536

Livingston (Scotland)

Fax: 01506 441687

Training

Tel: 01905 752526

Fax: 01905 752535

Literature Line

Tel: 01905 752556

or download instantly
from our website

www.worcester-bosch.co.uk



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