



The **Greenstar** range of high efficiency oil-fired condensing boilers from Worcester



Dedicated to heating comfort



## Greenstar high efficiency condensing boilers from Worcester. Providing energy-efficient heating and hot water with minimal impact on the environment

Worcester has been manufacturing boilers in the UK for over 45 years. We understand the importance of choosing the right appliance for your home: one that can satisfy your household's demands now and in the future. More recently environmental awareness has made your choice of boiler even more important and this guide has been developed in order to help you form an opinion that you can then discuss with your installer.

Today we all have far greater awareness of global warming, climate change, the need to greatly reduce 'greenhouse gas' emissions into the atmosphere, and the need to develop and utilise alternative renewable energy sources whenever and wherever we can. There's also the increasing need to counter the effects of unstable energy prices governed by supply, demand and world events beyond our control.

Faced with such a complex equation, investing in a new central heating boiler means that making the right choices has never been more critical; choices which are well informed and responsible, but at the same time satisfy everyday needs for

efficient, controllable and reliable heating and hot water. To help you make these choices, this guide from Worcester gives the answers to many important questions. You will also find that your local Worcester Accredited Installer (visit [www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk) to find your nearest installer) or OFTEC registered installer is also a valuable source of helpful advice and information.

### How Worcester is meeting the need

Today's condensing boilers are easily the most efficient that current technology can produce, and Worcester Greenstar boilers have a top-band 'A' rating, making them among the most energy-efficient domestic central heating boilers available.

Worcester is also providing further significant energy-saving and environmental benefits through the introduction of a range of renewable technology products for UK homes (see pages 25 and 26). Such innovations are possible because Worcester is part of the worldwide Bosch Group and enjoys very substantial research, development and other vital resources.

### Contents

	Page
What is a high-efficiency condensing boiler?	4
What should I consider when investing in a new boiler?	6
How do I decide which type of condensing boiler best suits my needs?	8
What are the benefits of choosing Worcester?	10
Greenstar condensing combi boilers.	12
Greenstar condensing system boilers.	14
Greenstar condensing regular boilers.	16
What control options are offered by Worcester?	20
Technology guide.	21
Other green Worcester energy-saving solutions.	25
Greenstar condensing boiler range specification & features.	27





Greenstar Heatslave condensing combi boiler

## What is a high efficiency condensing boiler and why is it more efficient?

During the operation of a boiler, exhaust gases are expelled out of the flue; a condensing boiler is able to extract and use much of the heat from the gases before the flue gases discharge. This ability to extract more heat from the fuel it consumes makes it more efficient and also reduces emissions.

### Why should I choose a condensing boiler?

Changes to the Building Regulations (effective from April 2007) require that in virtually all new domestic installations and boiler replacements which use oil, a condensing boiler is the only type permitted. This is in line with the Government's commitment to reduce the UK's energy consumption and emissions of harmful, climate-changing greenhouse gases such as carbon dioxide. The need for high-efficiency boilers is perhaps best summed up by the staggering fact that if every home in the UK installed a condensing boiler, the money saved would cover the cost of the annual combined fuel and power bills of more than two million households.\*

All Worcester Greenstar condensing boilers are rated in SEDBUK Band 'A' – the highest efficiency band achievable. They are more than 90% efficient – which in simple terms means that over 90% of the oil consumed is converted into heat for the heating and hot water system. There is very little energy wastage, so it requires less fuel to produce the heat you require, resulting in more economical running costs.

By comparison, many older boilers in use throughout the UK can be operating at as low as only 50% efficiency. In other words, 50 pence of every £1 in fuel bills is simply going 'up the chimney'. And even the many boilers in use which achieve 70-75% efficiency still waste a quarter of the fuel they consume.

This is why it makes such good sense to replace an old boiler with a new high efficiency condensing boiler – a move which could give you immediate savings of around 30% on your heating bills.\*

### What are SEDBUK ratings?

Seasonal Efficiency of Domestic Boilers in the UK is the method developed under the Government's Energy Efficiency Best Practice Programme, with the co-operation of boiler manufacturers, and it provides a basis for fair comparison of different boiler makes and models.

Specifically, SEDBUK is the average annual boiler efficiency achieved in typical domestic conditions, making reasonable assumptions about pattern of usage, climate, control and other influences. The Building Regulations referred to earlier, stipulate that the only condensing boilers which can be installed are those rated in Band 'A' (the highest and most efficient) or Band 'B'.

If your home currently has a central heating boiler with a SEDBUK rating label, the table below will enable you to compare it with a Band A or Band B high-efficiency condensing boiler.

Band	SEDBUK Range
A	90% and above
B	86% – 90%
C	82% – 86%
D	78% – 82%
E	74% – 78%
F	70% – 74%
G	Below 70%

All Greenstar condensing boilers are 'A' rated for their efficiency

### Is there an ideal time to install a new high-efficiency condensing boiler?

There's never a bad time to cut your fuel bills, but generally speaking new domestic boilers are installed for one of two main reasons: as part of a brand new central heating and hot water system, or to replace an old boiler which is past its best and is either inefficient or prone to costly breakdowns.

However, if you happen to be in the process of improving your kitchen or utility room, for example, it makes good sense to consider fitting a new high efficiency 'A' rated condensing boiler at the same time.

### Do condensing boilers offer any other benefits?

In addition to providing high level operating efficiency, a condensing boiler also dramatically reduces the emissions of both CO<sub>2</sub> (carbon dioxide) and NO<sub>x</sub> (nitrogen oxide) to extremely low levels – good news in the battle to combat global warming and address climate change, particularly as domestic central heating boilers currently account for about 21%\* of the UK's total carbon dioxide emissions.



## What should I consider when investing in a new boiler?

### Quality

Quality is a word we hear all the time, but what does it actually mean? When choosing a new boiler, it means having confidence that the money you spend will be an investment in your home. Your boiler works hard, day in and day out, to provide all the heating and hot water you need. You depend on it. When something goes wrong, it's a major inconvenience. So reliability is absolutely paramount. Worcester Greenstar boilers are manufactured using only high quality materials and components which have been developed and rigorously tested to provide long term reliability. A quality boiler is one which, with annual maintenance, is designed and engineered to deliver many years of reliable service. And the longer your boiler goes on working, the greater the value-for-money and return on your investment.

### Efficiency

Efficiency is the key benefit delivered by a condensing boiler. And for all the reasons outlined, not least your heating and hot water system's year-on-year running costs, efficiency in the consumption of energy is now an important responsibility for us all. Which is why choosing a high-efficiency condensing boiler that carries the additional

benefit of the highest energy-efficiency rating of all (Band A) not only addresses every criteria but simply makes the most sense.

### Back-up service

As with your car, an annual maintenance check of your boiler by a trained and qualified engineer is a sure way to keep your boiler operating at its optimum efficiency. Expressed another way, first-class after-sales is another important element of guaranteeing boiler durability and long-term value for money.

### Long-term as well as current needs

By choosing a proven manufacturer and a high-quality boiler that's built to last means that you can afford to think ahead. For example, if you have a young and growing family it's quite possible that your family's heating and hot water demands will change significantly within a few short years. Or you may be thinking in terms of switching in the future to solar water heating to complement your condensing boiler. Such considerations are important in making your choice, and your local OFTEC registered installer will be able to give you professional guidance and advice.





## How do I decide which type of condensing boiler best suits my needs?

There are three different types of high efficiency condensing boiler: combi, regular and system. Regular boilers are also sometimes referred to as traditional, heating only or conventional boilers – all effectively mean the same thing.

Each of the three types of boiler delivers all the benefits of high efficiency technology, but which one you choose will depend on several factors, including your property, your lifestyle and the professional advice of your OFTEC registered installer.

For example, the heating and hot requirements of a large family home with two or more bathrooms will differ considerably from those of an apartment or bungalow.

Here are a few examples and guidelines to think about and help you identify the type of condensing boiler most likely suited to your needs.

Consideration	Most suitable boiler
You want to use your loft space for a room conversion or other purpose	<b>COMBI</b>
You live in a flat or bungalow (i.e. have very little or no roofspace)	<b>COMBI</b>
Your home has more than 2 bathrooms	<b>REGULAR OR SYSTEM</b>
Your mains water pressure is low	<b>REGULAR OR SYSTEM</b>
You want to replace an old boiler to improve an existing conventional central heating system	<b>REGULAR, SYSTEM OR COMBI</b>
There is a need to have hot water available on tap, without waiting for it to heat up	<b>COMBI</b>



Greenstar Heatslave External condensing combi boiler

### What is a combi boiler?

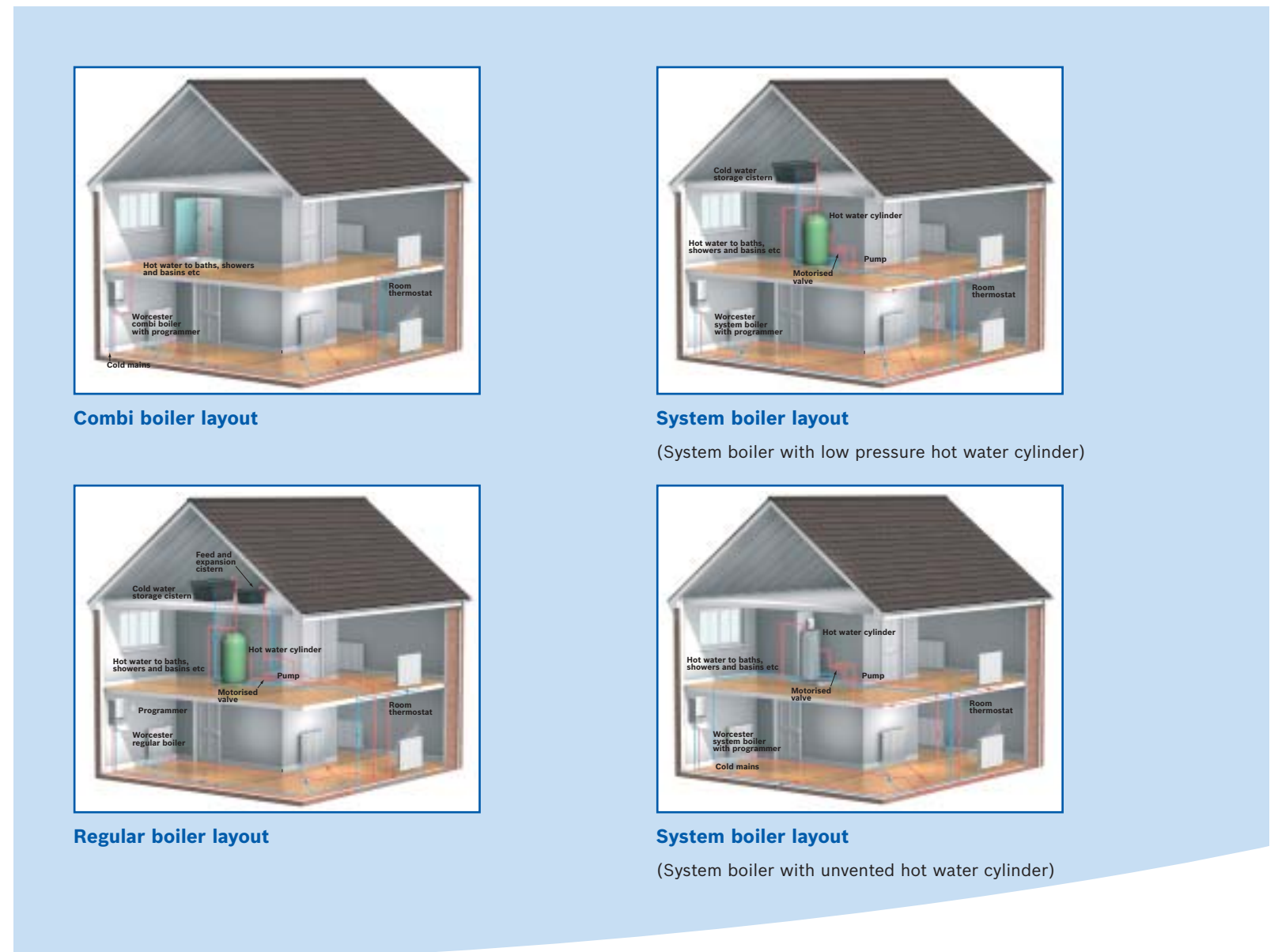
The high efficiency condensing combi (or combination) boiler is an ingenious space-saving idea, and an increasingly popular choice in UK homes. In fact, combis now account for well over half of all new domestic boilers installed in Britain every year.

The major difference between a combi and any other type of boiler is that a combi eliminates the need to store hot water, so there is no hot water cylinder in the airing cupboard or anywhere else on the system. A combi is both a high efficiency water heater and a central heating boiler, combined (hence the name) within one compact unit. In many cases it is fitted in the kitchen, although the utility room, garage or even outdoors are other possibilities.

The space savings result from the fact that as well as having no separate hot water storage cylinder, a combi doesn't need a cold water storage cistern or other familiar components of a regular (conventional) heating system.

The further benefits of this are a significant saving on hot water costs and the bonus of hot water delivered through your taps or other outlets at mains pressure – so a good flow rate can be achieved through the shower\* comparable to a power shower. Another combi benefit is that it can generally save you money on installation time and costs, since no tank in the roof space means less pipe work and therefore less time to install.

\* A thermostatically-controlled shower safeguards against sudden changes in water temperature. Flow is dependent on mains water pressure.



Combi boiler layout

System boiler layout

(System boiler with low pressure hot water cylinder)

Regular boiler layout

System boiler layout

(System boiler with unvented hot water cylinder)



Greenstar Camray System condensing system boiler

### What is a system boiler?

Unlike a combi, both a system boiler and a regular boiler work on the principle of stored hot water – but a system boiler differs from a regular boiler in two important respects.

Firstly, many of the major individual components of the heating and hot water system are built in, which means that installation is quicker, neater, easier and less costly.

Secondly, the hot water is pumped from the boiler through the system to the radiators and hot water cylinder, resulting in fast response and more economical running costs. The system boiler removes the need for a feed and expansion cistern in the loft.

### What is a regular boiler?

If you're replacing an older central heating system, the chances are that it will have a

regular boiler. A typical conventional system incorporates a boiler and controls, a feed and expansion cistern, and a hot water cylinder (usually in the airing cupboard) which is fed by a cold water storage cistern located in the loft.

### Solar compatibility

If you decide to have a new Greenstar system or regular boiler installed, it is worth bearing in mind that these types of boiler can be complemented by a Worcester Greenskies solar water heating system. This could provide between 50-70% of your annual hot water from a sustainable and free source of energy. Even if the idea of installing solar water heating is something for the future, you can prepare for it now by asking your installer to install your new boiler with a twin-coil hot water cylinder. This will save you money and inconvenience when you have a solar system installed.



## What are the benefits of choosing Worcester?

### The Bosch pedigree

For well over a century, Bosch has been one of the most respected names the world over for consistent quality, reliability, service and value for money. Worcester is part of the Bosch Group Heating Division, and similarly attains to the Bosch ideals and enjoys a reputation for attaining the highest standards.

### Advanced technology

The first Worcester oil-fired boiler was manufactured in 1962, when oil as a domestic fuel in the UK was very much in its infancy. From these early pioneering days has evolved the new generation of Worcester Greenstar high efficiency condensing boilers shown in this brochure – the most technically advanced and energy efficient range ever to carry the Worcester name.

### Higher efficiency for lower energy consumption

The more efficient your boiler, the less fuel you burn to produce all the heating and hot water you need and the lower your fuel bills. All Greenstar condensing boilers carry a SEDBUK Band 'A' energy efficiency rating and are more than 90% efficient. They are also in the top rating for producing minimal emissions of nitrogen oxide and carbon dioxide.

### Choice and versatility

The Worcester Greenstar range gives you a choice of 22 oil-fired boilers – 7 kitchen models (3 combis and 4 regular boilers with heating outputs ranging from 12-32 kW), 9 utility models (system and regular boilers delivering heat outputs ranging from 12-70 kW) and 6 external models (3 combis and 3 regular boilers with heating outputs ranging from 12-32 kW).

### Stylish and quiet kitchen boilers

Worcester Greenstar floor-standing oil boilers designed for installation in the kitchen are styled to blend with all other modern appliances. Their clean lines incorporate a distinctive Bosch grey fascia and a removable panel to fit the optional plug-in 7-day programmer (where applicable). The boiler cabinet also contains both acoustic and thermal insulation – the former to ensure that the boiler operates as quietly as possible and the latter to save heat and also prevent the possibility of uncontrolled heat making your kitchen uncomfortably warm.

### Practical and durable utility boilers

Particularly in larger homes, it is common practice to site an oil-fired boiler in a location other than the kitchen. Examples include a utility room, garage, outhouse or even a

purpose-built boiler house. The Worcester Greenstar range caters for this need with a choice of 9 utility models manufactured to the same exacting standards of quality, durability and reliability as all other Worcester boilers and giving excellent value for money.

### Robust external boilers

Where space within the home is at a minimum, the Worcester Greenstar External range gives you the option to install your oil-fired boiler outside. Manufactured to operate in all weather conditions, they offer all the outstanding qualities and reliability of all Worcester Greenstar internal models.

### Ease of replacing an old boiler

It is a further benefit of Worcester innovation and design that Greenstar Heatslave, Greenstar Camray and Greenstar Danesmoor boilers take up the same floor area as the older boilers they have superseded. This is in contrast to most other manufacturers who have had to increase the size of their boilers to incorporate the new high-efficiency condensing technology. So replacing an existing Worcester Heatslave, Camray or Danesmoor oil boiler with the equivalent condensing model could hardly be more convenient.

### Designed and manufactured for UK homes

The Worcester oil boiler manufacturing centre is located at Clay Cross in Derbyshire and the company's headquarters and main UK manufacturing centre are based on the outskirts of the city of Worcester. All Greenstar boilers and associated after-sales care are geared to satisfying the specific requirements of UK homes.

### Innovative features

All Greenstar boilers benefit from a host of advanced features which together add up to minimal running costs, greater reliability and better control over your system. Some of the key features incorporated in our boilers are described in detail in the Technology Guide which you'll find on pages 21-24.

### More control options

Worcester offers an optional twin-channel 7-day programmer for Greenstar Heatslave, Greenstar Camray and Greenstar Danesmoor kitchen boilers. This enables you to set 2 on/off time periods each day, for both central heating

and hot water independently, for each day of the week. It also incorporates a holiday mode feature for periods when the house may be unattended. See page 20 for more about heating controls.

### More fluing options

Although the kitchen or utility room is often favoured as the location for a modern streamlined boiler, with the added option of external boilers, the flexibility of Worcester flue design opens up the possibility to install your Greenstar condensing boiler in a variety of different locations in and around the home. Where your new boiler can be located will depend on a number of factors and your local OFTEC registered installer will be able to advise you of the options available.

### More customer services, more peace of mind

From pre-sales to after-sales, Worcester helps you in all sorts of ways. For information and advice – visit the website at [www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk) or call our dedicated UK-based helpline on **08705 266241**.

### Warranties

All Greenstar boilers carry a comprehensive 1-year warranty, extended free to 2 years on condition that you register the guarantee within 30 days of installation and have your boiler serviced in the first year. For added peace of mind, all Greenstar oil-fired boilers carry a 5 year\* warranty on the primary heat exchanger. There are also options to extend your cover period further still.

### Servicing and repairs

Worcester has a nationwide network of over 330 service engineers, each employed and trained directly by the company and providing a prompt, efficient quality service. Cost-effective optional annual service contracts and boiler protection plans give further peace of mind for the life of your Worcester boiler.

### Installing a Worcester high-efficiency boiler

Further information and advice on installing a Worcester condensing boiler is available from your local OFTEC registered installer, whose number should be listed in Yellow Pages. Alternatively, call Worcester on **08705 266241** to be put in touch with a professional installer in your area, or visit the website at [www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk)

\*The boiler must be serviced 12 months after installation.





Greenstar Heatslave condensing combi boiler



## Worcester Greenstar condensing combi boiler range

Boiler	CH output	Programmer option	Flow rate Litres per minute*	Flue options
<b>Floor standing models</b>				
<b>Greenstar Heatslave series</b>				
Greenstar Heatslave 12/18	12 – 18kW	•	15	Greenstar Oilfit 80/125mm flue systems
Greenstar Heatslave 18/25	18 – 25kW	•	18	Greenstar Oilfit 80/125mm flue systems
Greenstar Heatslave 25/32	25 – 32kW	•	22	Greenstar Oilfit 80/125mm flue systems

\* At 35°C Δ T



Greenstar Camray Utility System condensing system boiler



## Worcester Greenstar condensing system boiler range

Boiler	CH output option	Programmer	Flue options	Solar compatible
<b>Floor standing models</b>				
<b>Greenstar Camray Utility System series</b>				
Greenstar Camray Utility System 12/18	12 – 18kW	–	Greenstar Oilfit 80/125mm flue systems	
Greenstar Camray Utility System 18/25	18 – 25kW	–	Greenstar Oilfit 80/125mm flue systems	
Greenstar Camray Utility System 25/32	25 – 30kW	–	Greenstar Oilfit 80/125mm & 100/150mm flue systems	

### Solar compatibility

All Greenstar system boilers can be used with a Worcester Greenskies solar water heating system to provide additional hot water for your home (see pages 25 and 26).

Depending on the positioning of the solar panel, this could provide between 50-70% of your annual hot water free of charge and from a sustainable source of energy.





Greenstar Camray condensing regular boiler



## Worcester Greenstar condensing regular boiler range

Boiler	CH output	Programmer option	Flue options	Solar compatible
<b>Floor standing models</b>				
<b>Greenstar Camray &amp; Greenstar Danesmoor Kitchen series</b>				
Greenstar Camray 12/18	12 – 18kW	•	Greenstar Oilfit 80/125mm flue systems	
Greenstar Camray 18/25	18 – 25kW	•	Greenstar Oilfit 80/125mm flue systems	
Greenstar Camray 25/32	25 – 30kW	•	Greenstar Oilfit 80/125mm & 100/150mm flue systems	
Greenstar Danesmoor 18/25	18 – 25kW	•	Greenstar Oilfit 80/125mm flue systems	
<b>Greenstar Camray Utility &amp; Greenstar Utility series</b>				
Greenstar Camray Utility 12/18	12 – 18kW	–	Greenstar Oilfit 80/125mm flue systems	
Greenstar Camray Utility 18/25	18 – 25kW	–	Greenstar Oilfit 80/125mm flue systems	
Greenstar Camray Utility 25/32	25 – 30kW	–	Greenstar Oilfit 80/125mm & 100/150mm flue systems	
Greenstar Utility 18/25	18 – 25kW	–	Greenstar Oilfit 80/125mm	
Greenstar Utility 32/50	32 – 50kW	–	Greenstar Oilfit 100/150mm flue systems	
Greenstar Utility 50/70	50 – 70kW	–	Greenstar Oilfit 100/150mm flue systems	

## Solar compatibility

All Greenstar regular boilers can be used with a Worcester Greenskies solar water heating system to provide additional hot water for your home (see pages 25 and 26).

Depending on the positioning of the solar panel, this could provide between 50-70% of your annual hot water free of charge and from a sustainable source of energy.





Greenstar Heatslave External condensing combi boiler



## Worcester Greenstar External condensing combi boiler range

Boiler	CH output	Programmer option	Flow rate Litres per minute*	Flue options
<b>Floor standing models</b>				
<b>Greenstar Heatslave series</b>				
Greenstar Heatslave External 12/18	12 – 18kW	–	15	Greenstar Oilfit External BF system
Greenstar Heatslave External 18/25	18 – 25kW	–	18	Greenstar Oilfit External BF system
Greenstar Heatslave External 25/32	25 – 32kW	–	22	Greenstar Oilfit External BF system

\* At 35°C Δ T

## Worcester Greenstar External condensing regular boiler range

Boiler	CH output	Programmer option	Flue options	Solar compatible
<b>Floor standing models</b>				
<b>Greenstar Camray External series</b>				
Greenstar Camray External 12/18	12 – 18kW	–	Greenstar Oilfit External BF system	
Greenstar Camray External 18/25	18 – 25kW	–	Greenstar Oilfit External BF system	
Greenstar Camray External 25/32	25 – 30kW	–	Greenstar Oilfit External BF system	

## Solar compatibility

All Greenstar system boilers can be used with a Worcester Greenskies solar water heating system to provide additional hot water for your home (see pages 25 and 26).

Depending on the positioning of the solar panel, this could provide between 50-70% of your annual hot water free of charge and from a sustainable source of energy.



## What control options are offered by Worcester?

Installing effective controls with your new high efficiency condensing boiler will have a major impact on reducing the energy consumption of your central heating and hot water system as well as providing higher comfort levels.

Worcester offers control options for the Greenstar Heatslave, Greenstar Camray and Greenstar Danesmoor 18/25 Kitchen models, offering flexibility – whatever your lifestyle.

### Why are effective controls so important?

Apart from the very desirable benefits outlined above, controls enable you to minimise energy consumption by reducing temperature levels – but without any sacrifice in comfort. For example, if your room thermostat is set to 21°C (a typical temperature setting) and you reduce it to 20°C, your heating energy consumption can be cut by 6-10%.\*

The more sophisticated the controls you choose, the more precisely you can set temperature and time settings. And by timing your heating and hot water periods in tune with your lifestyle, you can reduce wasteful overheating.



### Do the Building Regulations which apply to condensing boilers also apply to controls?

Yes. In order to comply, the minimum requirements for controls with your new high efficiency condensing boiler are as follows:

#### Combi boilers

- A room thermostat
- For a new system, thermostatic radiator valves (TRVs) on all radiators except in the room with the room thermostat. For a replacement boiler only, TRVs are required on at least the bedroom radiators and preferably on all, except in the room with the room thermostat
- Timer/programmer

#### System and regular boilers

The requirements are the same as for combi boilers, with the following exceptions:

- Instead of a timer, a 'full programmer' must be installed, enabling the individual heating and hot water operations to be timed independently
- A cylinder thermostat to control hot water temperature
- The heating system must incorporate a pump

It is worth remembering that these are the minimum requirements and you can further improve your comfort levels and the economy of your heating system by exceeding these requirements.

## Control option for Worcester oil-fired boilers

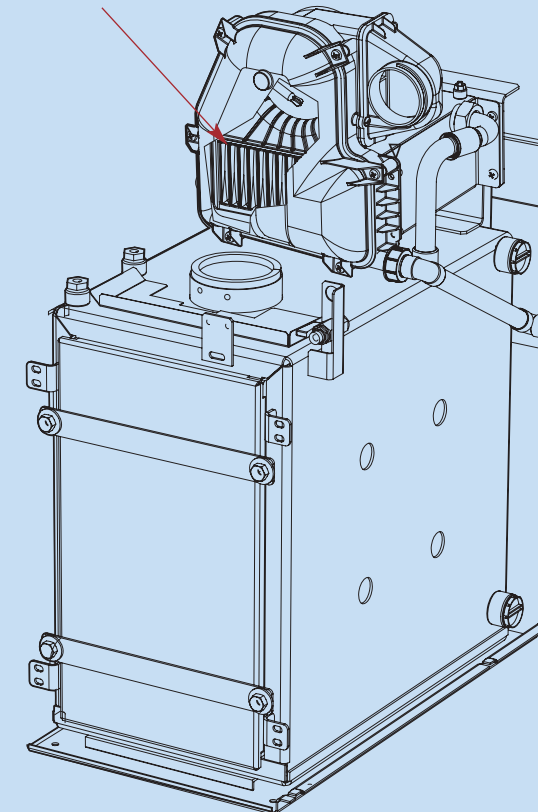


### Twin channel 7 day digital programmer

The optional plug-in programmer for the Greenstar Danesmoor 18/25, Greenstar Heatslave and Greenstar Camray kitchen ranges enables two heating and hot water on/off periods to be set each day of the week. The programmer also incorporates a 'holiday' setting. The digital unit fits simply into the fascia panel and the wiring for the timer is easily plugged into a pre-prepared socket.

## Technology guide

Secondary heat exchanger



Combustion chamber & primary heat exchanger

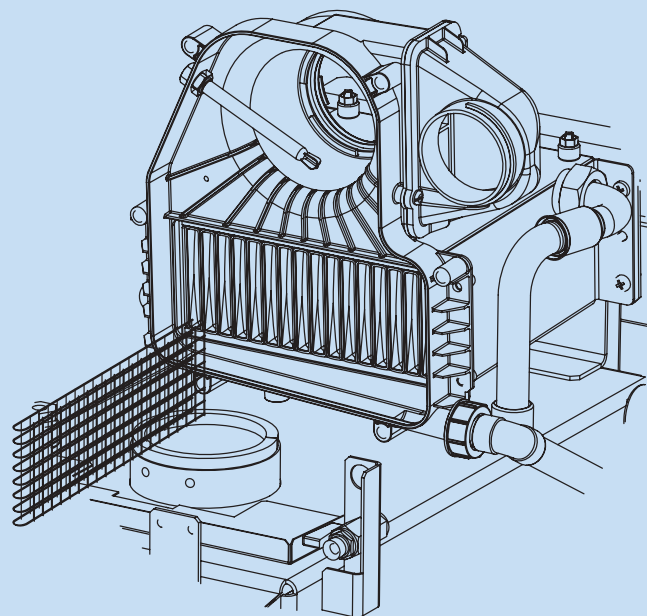
## Primary heat exchanger

Every Worcester Greenstar high-efficiency oil condensing boiler uses all the traditional components of an oil boiler and incorporates a primary and a secondary heat exchanger. They work together and are the heart of the boiler.

The primary heat exchanger is made of mild steel. It has two skins (layers): the inner skin is 5mm thick and in contact with the burner, and the outer is 3mm thick – dimensions precisely calculated to achieve optimum efficiency and durability.

The function of the primary exchanger is to transfer as much of the heat generated by the burner as possible to the water which lies in the space between the two skins. Baffle plates prevent the burner heat from escaping straight up the flue by directing it around all the surface areas of the exchanger.

There are also cold water anti-corrosion baffles, located in the cold water return in the bottom of the heat exchanger. These ensure that returning cold water is directed into the middle of the exchanger, thus reducing risk of corrosion in the bottom of the boiler.



## Secondary heat exchanger

Constructed of high-grade stainless steel, this increases the boiler's overall heat exchanger surface area, over which the flue gases must pass before they are discharged via the flue system connection. These gases are cooled and condense to liquid, releasing latent heat which helps to raise the efficiency of the boiler to 92-93% (SEDBUK Band A).

## Oil supply

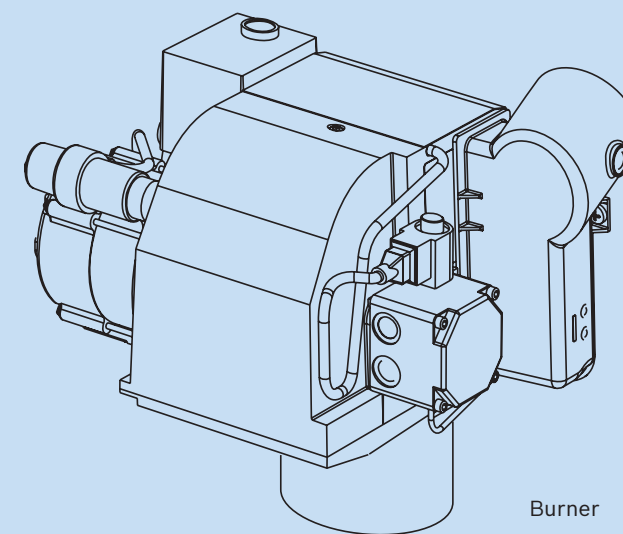
### Oil storage tank

A steel or plastic storage tank is an essential part of any domestic oil-fired central heating and hot water system. Running out of oil by letting a tank run dry can cause problems to your system and should be diligently avoided at all times.

Connected to the tank are a number of other necessary components: isolating valve, fitted to the tank outlet so that the oil supply can be turned off easily at any time; contents gauge – usually a clear tube giving a simple visual check but requiring that you first operate its spring-loaded isolating valve in order to achieve an accurate reading; and the outlet filter, to keep the oil supply to the boiler clean.

### Fire valve

This is an essential safety feature of the oil supply system and must be sited outside the building in which the boiler is located. In the event of a fire inside the building, the valve isolates the oil supply from the storage tank to the boiler. All Greenstar oil boiler cabinets are designed to accommodate the sensing element which automatically shuts off the fire valve.



## Burner

All Greenstar oil boilers feature an advanced pressure-jet burner. This has several main components: oil pump, burner motor, ignition transformer, ignition electrodes, nozzle and control box.

### Oil pump

Oil in liquid form will not burn; it will only ignite when vaporised or atomised. Hence from the storage tank and the various gauges, filters and valves, the oil goes directly to the pump, which pressurises it to between 100 and 145 psi (depending on the boiler model) and feeds it into the nozzle. In order for ignition to occur successfully, all the criteria of an exact science must be perfectly satisfied. The fine mist into which the oil is vaporised comprises predetermined proportions of air and oil, delivered to the ignition electrodes in a precisely measured amount and at precisely the right angle. Should any one of these critical factors be out of sync, the burner will at best be inefficient and at worst fail to operate.

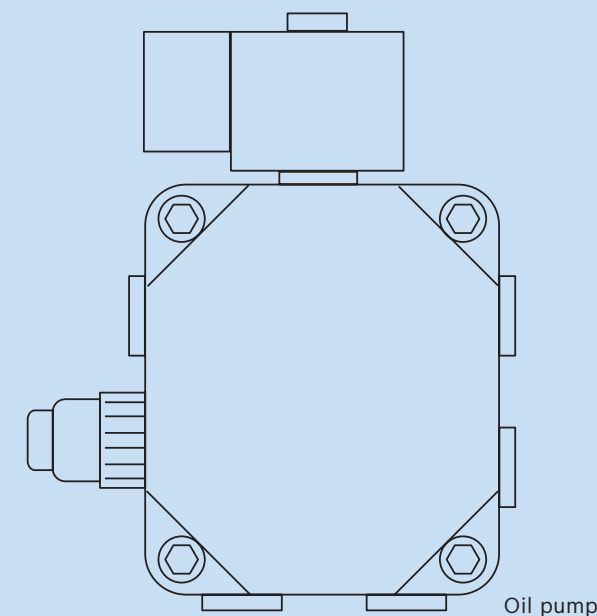
This is why annual servicing of an oil boiler is very important, particularly to ensure that the vital burner components remain in full and proper working order.

### Burner motor

Located on the burner, the motor fulfils two crucial functions: spinning the oil pump (to pressurise the oil) and turning the fan (to draw in air necessary for combustion).

### Control box

This is the brains of the burner. It orchestrates all burner functions in a precise preset sequence, including both pre- and post-ignition flame observation and all fail-safe procedures. A photoelectric cell detects that the flame has ignited and is burning correctly, as revealed by the flame pattern. The control box also features a restart button. In the unlikely event that the burner doesn't operate and locks out, pressing this button will restart it.





## Heating controls

The majority of heating systems have at least two controls: a time clock or programmer and room thermostat. In fact, this is the minimum level of electrical controls specified by the Building Regulations and is a legal requirement.

### Timer or Programmer

This operates the heating system to turn on for set periods of time.

It will take at least 30 minutes for your home to reach the desired temperature when the boiler fires up, depending on insulation levels and outside temperature.

So, set the timer to come on 30 minutes before you wake up in the morning. And, don't forget to readjust the timer when the clocks go forward and back.

### Room thermostat

This controls the air temperature and is usually positioned in the hall or landing or in an unheated room. The thermostat can be analogue or digital. Remember to site it away from direct sunlight and clear of curtains and furniture. As a guideline, your thermostat should be set between 18°C and 21°C.

### Programmable room thermostat

This allows you to programme the temperature levels to alter according to different times of the day and night. When programmed correctly this type of control prevents the system having to heat the house from a "cold start". The control always maintains a temperature within the property (as defined by the user). This ensures that the boiler is only ever "topping up" the temperature in the house.

### Frost thermostat

This is fitted either outside or in an unheated space, such as a garage. When weather conditions are extremely cold, the frost thermostat will operate the boiler and heating system even if the programmer is in an off position. This prevents the heating system and pipework being subjected to frost. A frost protection control is included in all Greenstar appliances, generally this is sufficient to protect the appliance. Some installations may require an additional frost thermostat wired in conjunction with a pipe thermostat; perhaps where there is exposed pipework or radiators in conservatories, garages etc.

## Radiators

There are three major components connected to a radiator – a manual air release vent, a lockshield radiator valve and a manual or thermostatic radiator valve.

### Manual air release vent

This is where any air within the radiator can escape. Radiators must be free of air and full of water to operate effectively, and by opening the vent with a special air vent key, excess air can be released.

### Lockshield radiator valve

When you have a new heating and hot water system installed, your installer should regulate the lockshield radiator valve so that the radiator heats up evenly throughout. Generally with a condensing boiler there is an approximate 20°C difference between the incoming flow of hot water and the outgoing water.

### Thermostatic radiator valves (TRVs)

The majority of radiators are fitted with these. They allow you to control the temperature of each room individually. The higher the number shown on the TRV, the hotter the room temperature, with the maximum being around 22°C.

Ideally, the TRV should be well exposed and not obstructed by furniture or curtains so that it can accurately detect the room temperature. Occasionally, it will shut down the radiator because the room has reached its maximum temperature.

This type of control influences the air temperature, not the temperature of water in the radiators.



## In Worcester's search for green energy solutions, the future is already here

The growing awareness of the current and future challenges which face us means that more people are aspiring to more efficient, economical and environmentally-friendly heating and hot water systems. Greenstar high-efficiency condensing boilers certainly fall into this category and as part of our commitment to providing alternative systems which use sustainable rather than fossil-fuel energy we have recently introduced Greenskies solar water heating and Greenstore ground source heat pumps. The concept of solar water heating is particularly relevant because it can be used in conjunction with your new Greenstar condensing regular or system boiler either immediately or it can be added at a later stage.

### What is sustainable energy?

Sustainable energy is best thought of as energy which can be replenished and causes no long-term damage to the environment.

For example, solar energy, wind energy and geothermal energy are all self-sustaining heating sources that cannot be depleted. The more we use these energy sources, the less we depend on non-renewable energy sources, such as fossil fuels (gas, oil and coal) and so aid their conservation.





Worcester Greenskies solar water heating

**Worcester Greenskies solar water heating**

It is a popular misconception that utilising solar energy is only possible in hot, sunny climates. The reality is that it is daylight rather than sunshine which is the important factor – which is why Worcester Greenskies solar water heating features ultra-sensitive panels developed to collect as much light as possible, even on the dullest days.

When you install a new Worcester Greenstar condensing regular or system boiler, either of which uses stored hot water, you can choose to heat your water with Greenskies solar panels by installing this system at the same time.

Alternatively, if the idea of energy-saving, pollution-free solar water heating appeals as a possible future option, you can prepare for it now by having our twin-coil hot water cylinder installed with your new Greenstar boiler. This will save you money and inconvenience when you make the eventual

switch from hot water produced by your Greenstar oil boiler to hot water produced by Greenskies solar panels.

The savings on your fuel bills can be very substantial, as solar panels could provide between 50-70% of your annual hot water.

**Worcester Greenstore ground source heat pumps**

Greenstore ground source heat pumps also utilise solar energy, but unlike Greenskies it is totally independent from gas or oil and in most cases does not require a boiler. In simplified terms, this ingenious and proven concept works by converting the solar energy that lies dormant in the ground into low-cost, highly efficient heating and hot water.

It is installed by burying liquid-filled collector loops in your garden, and is extremely reliable and long-lasting.



*The Greenstore system is a further example of Worcester's long-term commitment to developing practical sustainable energy solutions for domestic heating and hot water.*

**Government grants**

To find out more, visit [www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk) or [www.lowcarbonbuildings.org.uk](http://www.lowcarbonbuildings.org.uk). To qualify, you must have the work carried out by an approved professional installer.

For details of installers who have been fully trained by Worcester, visit [www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk)

**The Greenstar condensing boiler range specification and features**

Feature	CONDENSING REGULAR BOILERS												
	Danesmoor 18/25	Danesmoor Utility 18/25	Danesmoor Utility 32/50	Danesmoor Utility 50/70	Camray 12/18	Camray 18/25	Camray 25/32	Camray Utility 12/18	Camray Utility 18/25	Camray Utility 25/32	Camray External 12/18	Camray External 18/25	Camray External 25/32
SEDBUK (%) and band	92.9% Band A	92.9% Band A	93% Band A	92.5% Band A	93.1% Band A	93.2% Band A	94.2% Band A	93.1% Band A	93.2% Band A	94.2% Band A	93.1% Band A	93.2% Band A	94.2% Band A
Height (mm)	855	855	997	997	855	855	855	855	855	855	950	950	950
Width (mm)	370	370	520	520	370	370	370	370	370	370	565	565	565
Depth (mm)	600	600	815	815	600	600	600	600	600	600	780	780	780
Max. CH output (kW)	25	25	50	70	18	25	30	18	25	30	18	25	30
Multi-directional RS fluing, LH, RH rear & vertical	•	•	•	•	•	•	•	•	•	•	•	•	•
Maximum straight length RS horizontal flue (inc. terminal)	125mm 4,000	125mm 4,000	125mm 3,000	125mm 3,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000
Maximum straight length RS vertical flue (inc. terminal)	125mm 6,000	125mm 6,000	125mm 6,000	125mm 6,000	125mm 8,000	125mm 8,000	150mm 8,000	125mm 8,000	125mm 8,000	150mm 8,000	125mm 8,000	125mm 8,000	150mm 8,000
Burner	Bentone Sterling 50	Bentone Sterling 50	Bentone Sterling 133	Bentone Sterling 146	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2
Weight (kg)	119	119	270	280	100	102	108	101	103	110	114	115	122
RS flue diameter (mm)	125	125	150	150									
Open flue diameter (mm)	100	100	130	130									
Optional plug-in timeclock	•				•	•	•						

Feature	CONDENSING SYSTEM BOILERS				CONDENSING COMBINATION BOILERS				
	Camray Utility System 12/18	Camray Utility System 18/25	Camray Utility System 25/32	Heatslave 12/18	Heatslave 18/25	Heatslave 25/32	Heatslave External 12/18	Heatslave External 18/25	Heatslave External 25/32
SEDBUK (%) and band	93.1% Band A	93.2% Band A	94.2% Band A	90.2% Band A	90.1% Band A	90.3% Band A	90.2% Band A	90.1% Band A	90.3% Band A
Height (mm)	855	855	855	855	855	855	950	950	950
Width (mm)	370	370	370	520	520	520	690	690	690
Depth (mm)	600	600	600	600	600	600	770	770	770
DHW flow rate @ 35°C ΔT				15	18	22	15	18	22
Max. CH output (kW)	18	25	30	18	25	32	18	25	32
Multi-directional RS fluing, LH, RH rear & vertical	•	•	•	•	•	•	•	•	•
Maximum straight length RS horizontal flue (inc. terminal)	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000	125mm 4,000
Maximum straight length RS vertical flue (inc. terminal)	150mm N/A	150mm N/A	150mm N/A	150mm N/A	150mm N/A	150mm N/A	150mm Available summer 2007	150mm Available summer 2007	150mm Available summer 2007
Burner	Riello RDB 1	Riello RDB 2.2	Riello RDB 2.2	Bentone Sterling 40	Bentone Sterling 50	Riello RDB 2.2	Bentone Sterling 40	Bentone Sterling 50	Riello RDB 2.2
Weight (kg)	109	111	118	177	177	179	195	195	206
RS flue diameter (mm)					125				
Open flue diameter (mm)					100				
Optional plug-in timeclock				•	•	•			

NOTE: This matrix is for a guide only, full technical details are available within the Technical and Specification brochures for these products. Correct at time of printing.



## Useful numbers

### Consumer Helpline (Pre- & Post-Sales)

Tel: 08705 266241

Fax: 01905 752741

### Service

Tel: 08457 256206

Fax: 01905 757536

### Literature

Tel: 01905 752556

or download instantly  
from our website

[www.worcester-bosch.co.uk](http://www.worcester-bosch.co.uk)



Worcester, Bosch Group is a brand name of BBT Thermotechnology UK Ltd.

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Worcester, Bosch Group,  
Cotswold Way, Warndon,  
Worcester, WR4 9SW

Tel: 01905 754624 Fax: 01905 754619