

Technical and Specification Information

Mechanical range  
Comfort range  
Advanced intelligent range  
Wave smart control



## Worcester Controls range

**NEW**  
**Greenstar**  
**Comfort**  
**controls**

**WORCESTER**  
Bosch Group



## Worcester and you. Making a difference.

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

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 you deserve. Worcester employs a nationwide network of Service Engineers and technically trained Field Sales Managers

supported by an experienced technical services team which is able to provide comprehensive support and advice from designing system layouts through to installation.

Worcester is dedicated to providing energy efficient gas- and oil-fired condensing boilers, as well as an extensive range of renewable technologies. All of our products have been developed and introduced with the aim of helping the UK to achieve the Government's efficiency targets.



**BOSCH**  
Invented for life



The reception and main entrance at our Worcester headquarters

*“At Worcester we recognise the vital role you play in the specification and installation of energy efficient appliances in homes across the UK. We will continue to invest in our products, people, facilities and added value services to ensure you have all you require in order to deliver only the best solutions to your customers’ requirements.”*

Carl Arntzen,  
Managing Director,  
Bosch Thermotechnology Ltd.

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# Why are controls so important?

At Worcester, we believe in providing heating engineers with a range of choices that will enable them to provide the best solution for their customers. This philosophy is reflected in the breadth of our controls offering and our continued investment in developing new control technologies.



## Maximise energy efficiency

Over the last few years boilers have become increasingly efficient, with the best models now offering typical efficiencies of around 91% - close to the maximum that can be achieved through the design of the boiler itself.

So it makes sense to take a closer look at the other parts of the system where we can improve performance – and the controls side is an obvious area to focus on.

## Homeowner savings

Though 10-15 years ago, saving 10% on a fuel bill would not have been very significant, nowadays depending on your level of fuel consumption it could amount to as much as £150 and 630kg carbon dioxide\* a year, very quickly covering the cost of the chosen control.

## Best practice

Minimum control performance meets the demands of today's energy-conscious homeowner and modern heating controls are now much more accurate than 15 years ago. With energy prices set to continue rising for the foreseeable future, homeowners want maximum efficiency to keep their bills down and to minimise their carbon footprint.

## Building Regulations

Current and future editions of the Building Regulations are to demand higher levels of control to achieve greater efficiencies, while bringing them in line with the Code for Sustainable Homes.



### Code for Sustainable Homes

The Code for Sustainable Homes, which has been in effect since April 2007, introduced minimum standards in new homes for energy and water efficiency.



### The Energy-related Products Directive (ErP)

The next phase of the ErP Directive, for introduction in 2015, will set Europe-wide rules for the energy efficient design of heating products such as boilers. In the Directive, load compensation controls are recognised as improving the system efficiency by at least 3%.

### Intelligent control

For all of these reasons, Worcester's new generation of controls offer far more than a simple on/off control and have moved towards two-way communication between the boiler and room thermostat or weather compensation controller.

However, at the same time we understand that no matter how 'clever' controls get they need to be easy for the homeowner to use, otherwise they won't be able to control their heating and hot water to its full potential. Our simple user interface allows the customer to grasp the important functions of any control.



### Smart heating and hot water control

The new Worcester Wave smart control allows users to take control of their heating system from anywhere in the world\*.

Using a compatible Apple® iOS or Android™ device with a dedicated app installed, homeowners can alter the heating programme from the office, whilst travelling or on holiday. The heating schedule can be updated at any time to allow for the constant changes in routine that occur in many of today's lifestyles.



### 5 year guarantee on Worcester controls

When purchased and installed at the same time, the guarantee period for a Worcester control will match that of a Greenstar gas-fired boiler\*\*.

\*When an internet connection is available. \*\*Terms and conditions apply.

# Complete controls range

Worcester offers a wide range of controls from basic mechanical programmers to an internet-enabled smart control. Whatever the end user's specific preferences and budget, there is a Worcester control model to meet their needs.

## Simple-to-operate mechanical timer range



### MT10 mechanical timer

Analogue control for setting daily times for central heating. The heating will start and finish at the same times every day.

- Use the 'teeth' on the dial to set heating time periods
- The MT10 can be used in conjunction with the FR10 Intelligent Room Thermostat.



### MT10RF mechanical RF thermostat

There are two parts to the MT10RF, a transmitter and a receiver. They use radio frequency (RF) to communicate, which means there is no additional wiring required to install them.

- Analogue display for setting night and day time periods and temperature
- Heating can be set from the transmitter on the wall, no need to access the boiler.

## Greenstar oil-fired system and regular boiler programmer



### Twin channel 7-day digital programmer

The optional plug-in programmer for the Greenstar Danesmoor System, Greenstar Danesmoor regular and Greenstar Danesmoor WM ranges.

- Enables two heating and hot water on/off periods to be set for each day of the week
- Incorporates a holiday setting
- The digital unit plugs into the fascia panel
- The wiring for the timer is easily plugged into a pre-prepared socket.

## Sophisticated digital and wireless programmers and room thermostats

### Comfort range

The Greenstar Comfort controls range from a plug-in programmer to an advanced wireless programmer and room thermostat.

- Easy to install, no wiring required
- Thermostats incorporate load compensation which assesses the output and temperature of the boiler and adjusts the flow temperatures to heating demand
- Easy to use with clear visualisation of heating programme and intuitive menu navigation
- 7-day time control that can be programmed for up to six time periods per day, for heating and hot water.

### Advanced intelligent range

Wired programmers and thermostats with a wide range of advanced features.

- All controls in this range have load compensation and the FW100 has weather compensation
- Separate times and temperatures for the heating and hot water can be set for each day of the week
- Holiday function which suspends the normal heating and hot water times for the duration of the holiday and resumes them on return
- FR110 and FW100 have integrated solar control when installed with the ISM1.

### Wave smart control

The Wave is a smart, internet-connected programmable control for central heating and hot water which can be operated using a smart device.

- Simple to fit, just requiring a low voltage 2-core wire between the controller and the boiler – all other connections are via the Wi-Fi network
- External wired sensor not required for weather compensation as the Wave uses online data instead
- Intuitive and modern design ensures easy programming and control of the boiler resulting in a simple hand over with the end-user
- Energy graphs, home presence detection and many more features come as standard to ensure increased comfort and energy savings.



# The Greenstar Comfort controls range

Worcester's new Greenstar Comfort range of intelligent boiler controls has been developed by Worcester with the help of feedback from installers and end-users. As a result, they are our most advanced and simple to use controls yet – being easier to install and simpler to use, while producing a wider choice of programming options.



The thermostats communicate with the boiler via a very reliable wireless signal. Therefore no wiring is required, making them quick to install.

Unlike many wireless controls that just send on and off commands, they are able to have an intelligent conversation with the boiler. This enables load compensation, which assesses the output and temperature of the boiler and adjusts the flow temperatures to meet the heating demand, resulting in lower fuel bills.

Both heating and hot water can be altered up to six times a day with different settings for each day of the week. This gives the homeowner the opportunity to programme their heating to fit in with their varying daily routines.

## **There are three models in the Comfort range:**

- Greenstar Comfort – plug-in twin channel programmer
- Greenstar Comfort I RF – wireless room thermostat and plug-in twin channel programmer
- Greenstar Comfort II RF – wireless programmable room thermostat and plug-in RF receiver.



## Technical data – Comfort range

Controller model	Comfort	Comfort I RF	Comfort II RF
Height	110mm	110mm	111mm
Width	133mm	133mm	134mm
RF	✗	✓	✓
Load compensation	✗	✓	✓
Rated current	2-wire BUS	2-wire BUS	2-wire BUS
Control range	4 - 30°C in steps of 0.1°C	4 - 30°C in steps of 0.1°C	4 - 30°C in steps of 0.1°C
Permissible ambient temperature	0 - 60°C	0 - 60°C	0 - 60°C
Protection level	1PX2D	1PX2D (fascia mounted) IP20 (wall mounted)	IP20
Control position	Fascia mounted	Programmer fascia mounted/ Thermostat wall mounted	Wall mounted

## Compatibility

		Gas-fired boilers									Oil-fired boilers					
		COMBI					SYSTEM <sup>^</sup>				REGULAR <sup>*</sup>	COMBI		SYSTEM	REGULAR	
		CDi Classic <sup>2</sup>	CDi Compact	Si Compact	i Junior	Highflow CDi	CDi Classic System	27i System and 30i System	12i System and 24i System	27Ri and 30Ri		Heatslave II	Heatslave II External	Danesmoor System	Danesmoor	Danesmoor WM
Comfort controls	Part no.															
Comfort	7 733 600 003	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓	✓ <sup>2</sup>	✓	✓ <sup>3</sup>		✓	✓ <sup>4</sup>				
Comfort I RF	7 733 600 001	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓	✓	✓ <sup>4</sup>				
Comfort II RF	7 733 600 002	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓	✓	✓ <sup>4</sup>				

<sup>\*</sup>With optional wiring centre (see page 21).

<sup>^</sup>With optional integral diverter valve.

<sup>1</sup> Manufactured after July 2013.

<sup>2</sup> Manufactured after 16th January 2007 with software version CF12.10 onwards.

<sup>3</sup> Manufactured after February 2011.

<sup>4</sup> Must be used with Comfort wall plate kit.

Correct at time of printing. For the latest list of compatible boilers see the Worcester website.

# Comfort twin channel programmer

This is a twin channel programmer that plugs directly into the boiler and requires a separate room thermostat (not included).



## Features and benefits

- 7-day time control for heating and hot water
- Three adjustable heating and hot water time periods
- Pre-set heating and hot water programme
- Clear back-lit display
- Automatic adjustment to British summer/winter time
- Clear visualisation of heating programme
- Easy menu navigation
- Holiday mode of which only frost protection will remain active throughout this programmable period.

## Quick to install

The Comfort twin channel programmer simply plugs into the boiler, with a connection to a separate room thermostat. Programming functions are then accessed directly on the programmer.



## Easy menu navigation

Navigation through the menu is also very straightforward, simply requiring rotation of the push button to quickly scroll through the options.

## Programme to fit the household's routine

Both the heating and hot water can be programmed to come on and off up to three times a day and this can be set differently for each day of the week to fit in with the homeowner's routine.

## Comfort wall plate kit

Where the boiler is in a location that is difficult to access, such as a garage or loft, an optional plate kit can be used to mount the controller on a wall, with a low voltage 2-core wire connection back to the boiler.

## Clear back-lit display

The large, back-lit screen provides a clear and easy interface to key information such as current heating and hot water operation and programming options. Further information includes time and day, burner on indicator, fault codes and central heating programme visualisation bar.

## Easy to use

Based on feedback from end users and installers, the control menu has been designed to provide exceptional and intuitive ease-of-use, enabling users to become familiar with the system very quickly and take advantage of all of the available control options.

# Comfort I RF twin channel programmer and room thermostat

The Comfort I RF twin channel model is an intelligent programmer that plugs into the boiler and is supplied with a separate room thermostat for adjustment of room set-points temperature.



## Features and benefits

All the features of Comfort (page 10) while also including:

- Load compensation for enhanced efficiency
- Extremely reliable RF signal
- RF signal strength indicator to identify best location
- Pre-paired transmitter and receiver
- Landlord function.

## Load compensation

The Comfort I and II RF thermostats are able to have an intelligent conversation with the boiler. This enables a load compensation function that is capable of delivering up to 3% savings, based on measurements documented in the ErP Directive (Energy-related Products Directive). Load compensation works by comparing the actual temperature and the set-point temperature and adjusting flow temperature accordingly to maintain a low return water temperature for maximum condensing.

## Extremely reliable RF signal

Using the latest RF (radio frequency) technologies for maximum reliability, the Comfort I provides wireless communication between the boiler room thermostat transmitter. It includes a radio signal strength indicator menu to assist in finding the best location for the room thermostat.

## Holiday mode

The system can very simply be set to holiday mode, during which time the heating system provides frost protection only, while the hot water is switched off.

## Landlord function

A 'landlord function' for enabling a maintenance/annual service date to be set is also available for social housing customers.



# Comfort II RF twin channel programmer

The Comfort II RF is the top of the range control with a plug-in RF receiver on the boiler and a wall-mounted programmer and room thermostat combined in one unit.



## Features and benefits

All the features of Greenstar Comfort and Comfort I (pages 10 & 11) while also including:

- Six adjustable heating temperatures for each set-point per day
- Programme and control heating and hot water at the room thermostat – perfect for boilers that are not easily accessible
- Additional installer functions.

## Programme and control your heating and hot water at the room thermostat

The combined programmer and room thermostat can be mounted on a wall in the living space. This provides access to all control functions at a single, easily accessible location. This is also particularly useful in situations where the boiler is difficult to access, such as in a garage or loft.

## Straightforward menu

The control's functions can be accessed through a simple menu structure with a minimal amount of steps required to programme the preferred setting. The menu navigation is circular, when the last item on a 'menu tree' is reached it goes back to the start of the menu.

## Six heating set-points per day

Availability of up to six heating set-points per day provides unparalleled flexibility to align boiler operation to the precise occupancy patterns within the home.

## Clear visualisation of heating programme

When in programming mode, a graphical display at the bottom of the screen shows the set heating times for the day.

## Installer functions

The Greenstar Comfort II RF control includes a number of functions that are for exclusive use by the installer/service engineer for use during installation, commissioning, annual servicing and to assist with fault-finding. Maintenance and boiler diagnostic features include detailed system information and diagnostic history.



# Installing and commissioning the Greenstar Comfort range of controls



## Room thermostat mounting

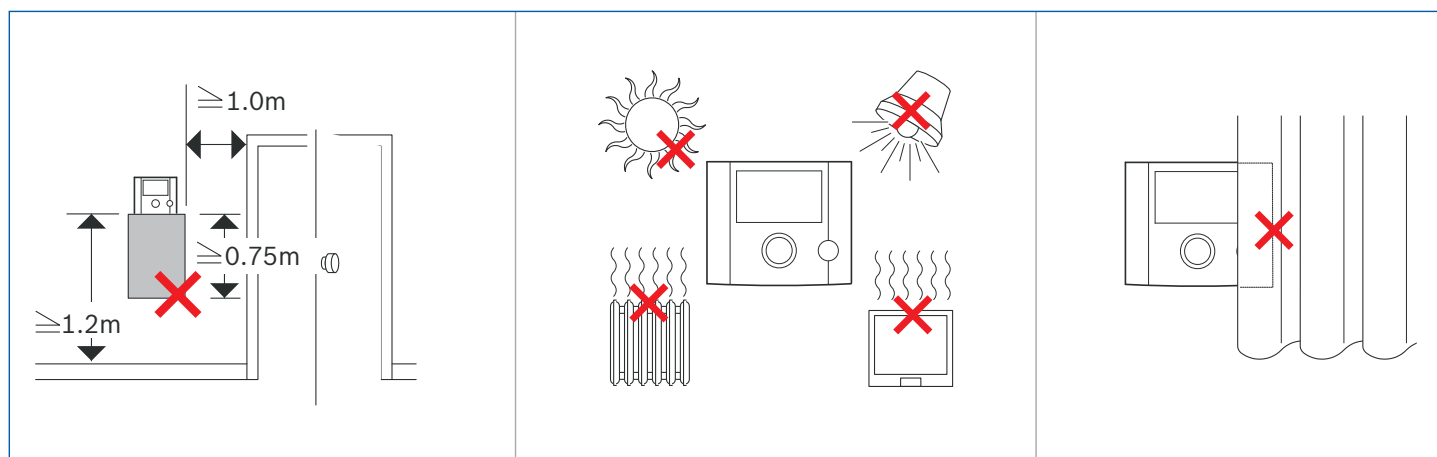
The accuracy of a room thermostat is dependent upon the installation location.

Any radiator in the same room as the room thermostat should NOT have a thermostatic radiator valve fitted.

The room thermostat should be installed so that the overall temperature of the property is monitored, for example hallways or landings, and not be installed in a living room or room with supplementary heating.

## Commissioning

Comprehensive installation and commissioning instructions can be found within the installation and user instructions supplied with the units.



Selecting the installation location



# The advanced intelligent controls range

Worcester offers a range of wired intelligent heating controls, designed to enhance the integral efficiency of our current Greenstar boilers and feature weather and load compensation.



In the forthcoming ErP Directive (Energy-related Products Directive) that is part of new Europe-wide legislation, load compensation controls are recognised as improving system efficiency by at least 3% and weather compensation by 4%, resulting in lower fuel bills.

By using low voltage power the controls also avoid the need for compliance with Part P of the Building Regulations.

## **There are four models in the intelligent controls range:**

- FR10 Intelligent Room Thermostat – can be used in conjunction with any external 230V programmer
- FR110 Programmable Room Thermostat – Load Compensation Thermostat and programmer
- FW100 Weather Compensation Controller – Weather Compensation Thermostat and programmer with outdoor sensor
- ISM1 Intelligent Solar Module – for use with either the FR110 or FW100 to provide control of the solar system.

## Technical data – advanced intelligent controls

Controller model	FR10	FR110	FW100	ISM1
Height	85mm	119mm	119mm	110mm
Width	100mm	134mm	134mm	156mm
Depth	35mm	35mm	35mm	55mm
Rated voltage EMS-BUS	10 – 24V DC	10 – 24V DC	10 – 24V DC	10 – 24V DC
Rated voltage	–	–	–	230V AC
Rated current	≤ 3.5 mA	6 mA (exc. illumination)	6 mA (exc. illumination)	4 A
Controller output	2-wire BUS	2-wire BUS	2-wire BUS	2-wire BUS
Maximum output per connection	–	–	–	120W
Control range	5 – 30°C in steps of 0.5°C	5 – 30°C in steps of 0.5°C	5 – 30°C in steps of 0.5°C	–
Permissible ambient temperature	0 – +50°C	0 – +50°C	0 – +75°C	0 – +50°C
Protection level	IP20	IP20	IPX2D (fascia mounted) IP20 (wall mounted)	IP44
Controller position	Wall mounted	Wall mounted	Fascia mounted/ wall mounted	Wall mounted

## Compatibility

Intelligent controls	Part no.	Gas-fired boilers							Oil-fired boilers						
		COMBI			SYSTEM ^				REGULAR *	COMBI	SYSTEM	REGULAR			
		CDi Classic <sup>2</sup>	CDi Compact	Si Compact	i Junior	Highflow CDi	CDi Classic System	27i System and 30i System	12i System and 24i System	27Ri and 30Ri	Heatslave II	Heatslave II External	Danesmoor System	Danesmoor	Danesmoor WM
FR10 intelligent room thermostat	7 716 192 065	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓		✓			✓	✓ <sup>4</sup>			
FR110 programmable room thermostat	7 716 192 066	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓	✓ <sup>2</sup>	✓	✓ <sup>3</sup>						
FW100 weather compensation controller	7 716 192 067	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓	✓ <sup>2</sup>	✓	✓ <sup>3</sup>						
ISM1 intelligent solar module	7 716 192 068						✓ <sup>2</sup>	✓	✓ <sup>3</sup>						
Outdoor weather sensor	7 716 192 764										✓	✓			

\*With optional wiring centre (see page 21).

^With optional integral diverter valve.

1 Manufactured after July 2013.

2 Manufactured after 16th January 2007 with software version CF12.10 onwards.

3 Manufactured after February 2011.

4 Must be used with an external propriety 230V timer.

Correct at time of printing. For the latest list of compatible boilers see the Worcester website.

# FR10 Intelligent Room Thermostat

The FR10 is an intelligent room thermostat that enables load compensation and will offer energy savings compared to standard on/off controls. It can be used in conjunction with your existing external 230V programmer.



## Features and benefits

- Compatible with your existing external 230V programmers
- Programmer and room thermostat separate, familiarity for end user
- Large, clear display, simple dial adjustment
- Easy for installer to explain operation
- Hidden intelligence
- No additional knowledge required for end user operation
- Load compensation
- Increased efficiency of condensing boiler.

## Load compensation

The FR10's load compensation feature means that, rather than just switching the boiler on and off, it will adjust the flow temperature of the central heating water in line with set heating temperature requirements. The smaller the difference between the actual temperature and the set-point temperature, the lower the flow temperature from the boiler.

In this way the FR10 minimises boiler cycling so less energy is wasted in firing up the boiler after each 'off' cycle.

## Wall mounted

Typically, the FR10 is mounted on the wall in the same position in the property as a traditional thermostat. As with traditional thermostats, any radiators in the same space as the controller should NOT be fitted with a thermostatic radiator valve (TRV).



## Easy to use

Operation by the user is very similar to traditional thermostats, with a large clear display and simple dial for adjusting set-point temperature. Consequently, it is very easy to explain to the end user.

# FR110 Programmable Room Thermostat

The FR110 is an intelligent programmable room thermostat that enables load compensation for heating and time control of hot water systems.



## Features and benefits

- Wall mounted, with clear back-lit display
- Ease of use for the installer and end user
- Programmable room thermostat
- Varied temperatures throughout the day
- Economy temperature
- Integrated solar control using ISM1
- Removes need for separate Worcester TDS10 controller
- Maximum benefit and efficiency from solar installation
- Load compensation
- Increased efficiency of condensing boiler.

## Six heating and hot water set-points

The controller provides the choice of six weekly heating programmes, with six switching points per day. When used with system boilers it also offers a weekly hot water programme with six switching points per day. On combi boilers the six switching points can be used to switch pre-heat on where the hot water will be delivered to the tap quickly, and energy saving economy mode where the pre-heat function is turned off.

## Pre-set heating programmes

The FR110 offers three pre-set temperature profiles for added convenience.

- Comfort setting (21°C), typically for use in the morning and evening
- Economy setting (15°C), typically used to keep the building warm through the day
- Frost protection (5°C), for when the property is unoccupied for long periods or the heating is off in cold weather.

## Battery back-up

Use of a low voltage supply from the mains, rather than relying on battery power, provides a clearer display for the user and ensures they don't have to worry about replacing batteries. For extra peace of mind, the controller is supplied with a battery that will provide up to six hours back-up.



## Load compensation

Once installed, the FR110's integral low voltage EMS Bus device communicates with the boiler's built-in Heatronic 3 controls to provide load-compensated control that finely tunes flow water temperatures to heating demand.

The resultant reduced boiler cycling and the fact that the boiler remains warm rather than frequently cooling down and heating up again provides energy savings compared to older style controllers.

## Integrated solar heating control

The FR110 can also be used in conjunction with Worcester's ISM1 Intelligent Solar Module (see page 20) to optimise use of renewable solar energy for water heating.

# FW100 Weather Compensation Controller

The FW100 is a weather compensation controller that enables the boiler to anticipate changes in heating demand in relation to external temperatures. It comprises a programmable indoor unit to control the boiler and an external sensor located on a north facing wall.



## Room thermostat and programmer combined

The FW100 combines the functions of a room thermostat and programmer and incorporates factory-set heat curves for use with radiators, underfloor heating and fan convectors, making commissioning very straightforward. The units also include a manual override for the user to boost or reduce heating if and when required.

## Multiple heating programmes

The FW100 offers the user three weekly heating programmes, with six switching points per day and a weekly hot water programme with six switching points per day.

The FW100 is compatible with the ISM1 Intelligent Solar Module (see page 20).

## When to use weather compensation controllers rather than room thermostats

There are a number of situations where weather compensation controllers will offer better control and higher comfort levels compared to room thermostats. In choosing the most appropriate solution for the end user, it is important to understand how the system will be used and the nature of the building.

## Features and benefits

- Wall or fascia mounted
- Installation flexibility
- Factory set parameters
- Quick to install and commission
- Economy temperature
- House never goes cold
- Integrated solar control using ISM1
- Removes need for separate Worcester TDS10 controller
- Solar optimisation
- Maximum benefit and efficiency from solar installation
- Weather compensation
- Increased efficiency of condensing boiler.

The list below shows the key criteria that should be applied when choosing the most appropriate controls and discussing the options with the end user. If the answer to the majority of the questions below is 'yes', a weather compensation controller would be the most suitable option.

- Are there many rooms in the dwelling that are used frequently and in different ways?
- Does the dwelling contain windows that are facing in different directions?
- Does the home have an open fire, gas fire or other heat source that does not heat all rooms equally?
- Does the end user want a higher degree of comfort control in all rooms?
- Does the customer accept the pump will run more often if a higher degree of comfort and better energy utilisation are to be achieved?
- Are TRVs installed in all rooms?
- Are there factors that prevent the heating controller being installed in the living area?
- Can an outdoor sensor be installed on a north facing wall?
- Does the end user want to achieve optimum comfort with minimum energy consumption and are they prepared to pay a little extra for enhanced control?



# Installing and commissioning the advanced intelligent range of controls

## Installation

The accuracy of a room thermostat is dependent upon the installation location.

Any radiator in the same room as the room thermostat should NOT have a thermostatic radiator valve fitted.

The room thermostat should be installed so that the overall temperature of the property is monitored, for example, hallways or landings and not be installed in a living room or room with supplementary heating.

## Electrical connections

The Worcester range of intelligent controls does not require a 230V mains supply. Instead, connection is made to the boiler via the BUS connections on the Heatronic 3 circuit board within the appliance. All BUS connections are polarity free.

Permissible cable lengths and cross sections are shown in the table below:

Cable length	Cross-section
≤ 80m	0.40mm <sup>2</sup>
≤ 100m	0.50mm <sup>2</sup>
≤ 150m	0.75mm <sup>2</sup>
≤ 200m	1.00mm <sup>2</sup>
≤ 300m	1.50mm <sup>2</sup>

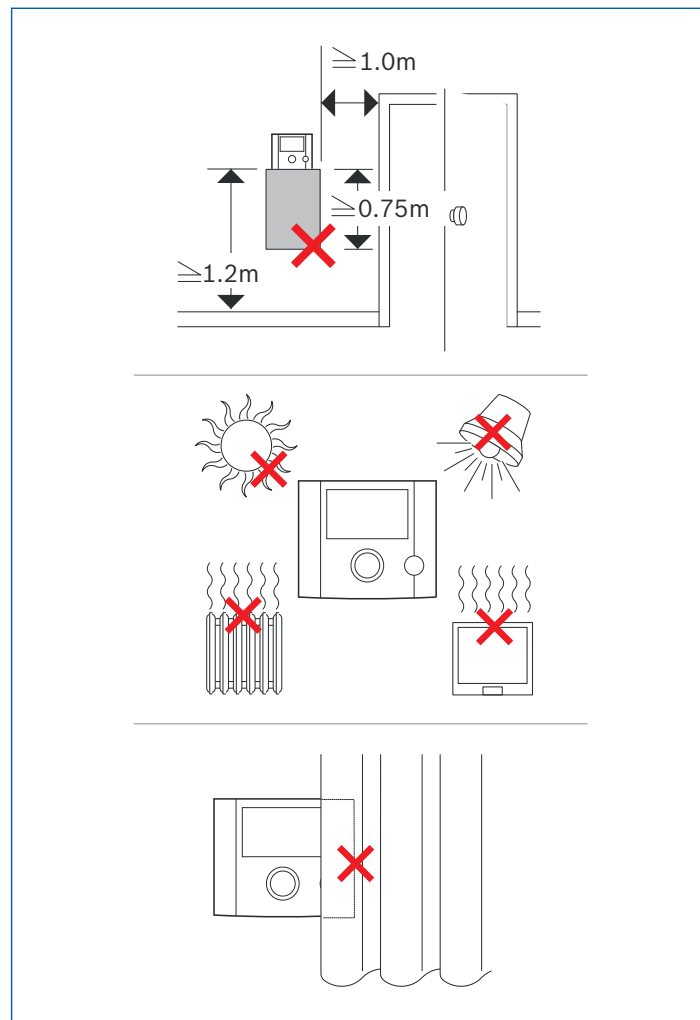
Permissible cable lengths to FW100 outside temperature sensor:

Cable length	Cross-section
≤ 20m	0.75mm <sup>2</sup> – 1.50mm <sup>2</sup>
≤ 30m	1.00mm <sup>2</sup> – 1.50mm <sup>2</sup>
≥ 30m	1.50mm <sup>2</sup>

To avoid inductive interference, lay all BUS cables separately to lines of 230V or 400V (minimum spacing 100mm).

In case of external inductive interference, screened cables should be used. This ensures that the cables are shielded from external interference (e.g. heavy current cables, overhead wires, transformer stations, radio and television sets, amateur radio stations, microwave ovens etc).

## Siting



Selecting the installation location

## Commissioning

Comprehensive installation and commissioning instructions can be found within the installation and user instructions supplied with the units.

# ISM1 Intelligent Solar Module

The ISM1 is a specially designed interface that integrates a solar heating system with a solar-compatible weather or load compensation unit such as the FW100 or FR110.



The ISM1 enables the hot water system to take heat from the solar panels when the sun is shining and then bring the boiler back on when there is not enough sunshine available. In this way, the user gets maximum benefit from solar heating while ensuring that hot water is always available.

Another major benefit of this arrangement is that the end user only needs one controller to control both the solar and boiler systems, making the system much easier to use. The in-built intelligence of the FR110 and FW100 ensure that solar-related information is only displayed when the ISM1 is connected, to avoid confusion.

The ISM1 is compatible with Greenstar CDi Classic System boilers providing the optional integral diverter valve is used and has the potential to reduce energy consumption by 15% compared to conventional systems.

## Installation

The following components may be supplied by the unvented domestic hot water cylinder manufacturers, please refer to the installation instructions. Alternatively they are available at plumber's merchants.

- High limit control
- Solar return two port valve
- Solar wiring centre.

## Features and benefits

- All solar control via FR110 or FW100 controller
- Only one control to explain to end user
- Displays solar performance on FR110 or FW100
- End user can check solar input
- Clear colour coded plug-in connections
- Installation ease
- Solar optimisation
- Maximum benefit and efficiency from solar installation.

## Connection – low voltage section with BUS connection

Permissible cable length between the Heatronic 3 with BUS capability and the ISM1:

Cable length	Cross-section
≤ 80m	0.40mm <sup>2</sup>
≤ 100m	0.50mm <sup>2</sup>
≤ 150m	0.75mm <sup>2</sup>
≤ 200m	1.00mm <sup>2</sup>
≤ 300m	1.50mm <sup>2</sup>

To avoid inductive interference, lay all BUS cables separately to lines of 230V or 400V (minimum spacing 100mm).

## Solar panel and cylinder sensors

Dedicated sensors for both the solar panel and the hot water cylinder are supplied with ISM1.

When sensor leads are extended, apply the following lead cross-sections:

Cable length	Cross-section
≤ 20m	0.75mm <sup>2</sup> – 1.50mm <sup>2</sup>
≤ 30m	1.00mm <sup>2</sup> – 1.50mm <sup>2</sup>
≥ 30m	1.50mm <sup>2</sup>

## 230V AC connection

Mains voltage should only be installed to the terminals on the left of the ISM1 and under no circumstances be connected to the BUS or sensor terminals.

# Greenstar Wiring Centre

The innovative Greenstar Wiring Centre enables intelligent control of heating and hot water for systems using our higher output regular boilers, while also reducing the workload and saving time for the installer.



## Enabling plug-in, fascia mounted digital timers and programmers for Greenstar 27Ri and 30Ri regular boilers

The Greenstar Wiring Centre is a major benefit for installers and end users, allowing the use of Worcester's plug-in RF controls, including wireless models, to be used on the new Greenstar 27Ri and 30Ri regular boiler. This enables digital timers and programmers to control the heating and hot water for regular boilers systems. The wiring centre clearly distinguishes whether the cylinder needs hot water or if the home needs heating and, to maximise comfort and efficiency, responds by operating the boiler at different temperatures for each.

## Simple, time-saving installation

An innovative feature of the Greenstar Wiring Centre is that it allows the pump to be wired into the wiring centre, rather than going through the household between the airing cupboard and the boiler. In replacement installations, this means the existing 3-core cable between the boiler and pump can be utilised to carry communication signals (EMS-BUS) from the wiring centre to the boiler. Experience shows this can save as much as half a day of installation time.

The Greenstar Wiring Centre uses simple, clear, colour-coded connections and is supplied with a cylinder sensor and unique retaining device as standard.

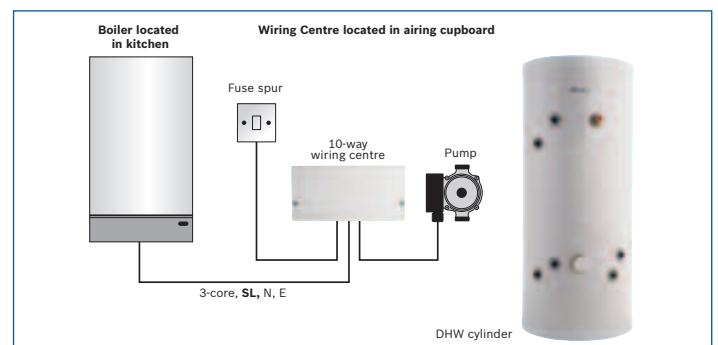
## Features and benefits

- Allows digital timers and programmers to be used with a regular boiler – controls both heating and hot water
- Enables properties to use a wireless room thermostat which allows a wider choice of controls options
- Pump is wired directly into the Wiring Centre and not to the boiler
- Simple system-type selector (S or Y plan) – simple, clear wiring connections
- Up to three Greenstar Wiring Centres can be linked together to control up to eight zones
- Supplied complete with cylinder sensor and unique retaining device
- Compatible with Worcester Greenstore unvented cylinders and third party unvented and vented cylinders\*
- IP44 safety rating increases possible installation locations.

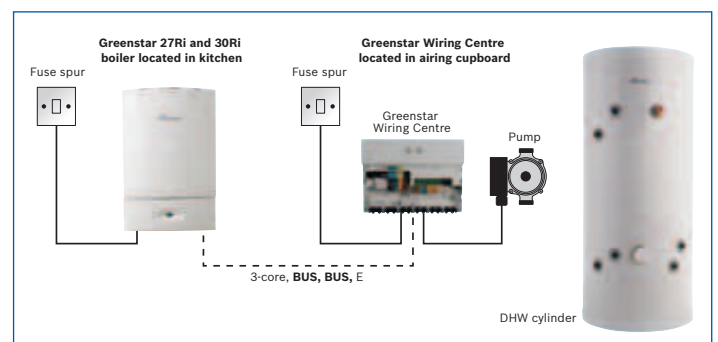
## Control options

The Greenstar Wiring Centre allows the Greenstar 27Ri and 30Ri regular boilers to be compatible with the following Worcester plug-in controls:

- Comfort I RF
- Comfort II RF.



Existing boiler system layout



System layout with a Greenstar Wiring Centre

## Product info

Part number	7 738 110 116
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\*Please check with the manufacturer. Makes replacement boiler installation much easier.

# Wave smart control

The Wave is a smart, internet-connected programmable control for central heating and hot water which can be operated using a smart device.



The Wave's innovative programming enables it to have an 'intelligent conversation' with the boiler and take advantage of advanced control features such as weather and load compensation.

## Enhanced energy efficiency

In the forthcoming ErP Directive (Energy-related Products Directive) that is part of new Europe-wide legislation, smart controls like the Wave are recognised as improving the system efficiency by at least 4%^, resulting in lower fuel bills.

The Wave's energy efficiency features include:

- Charts of heating and hot water usage so that it is easy to identify where potential savings could be made
- When the room temperature is turned down a leaf symbol will appear to indicate additional savings are being made.

## Adapting to the end user's needs

Each Wave unit is supplied with a pre-set programme that can be easily modified to suit the user's requirements. The Wave's advanced user features include:

- 'Pairing' with up to eight devices, automatically sensing when people are at home. Sensing to an individual device can be turned off if required
- The Wave will remember preferred programme settings to make these easily available and features a 'holiday programme', requiring just a start and finish date
- Unlike some other smart heating controls, the Wave can also programme the hot water settings, providing additional energy savings and comfort
- For security and peace of mind, all of the Wave's data is owned by the user, ensuring no information is shared with other parties.

## Technical data – Wave

<b>Controller model</b>	<b>Wave</b>
<b>Dimensions (H x W x D)</b>	145 x 100 x 27mm
<b>Connection (Wi-Fi)</b>	802.11b/g
<b>Voltage supply</b>	14.3 to 16.0V DC
<b>Consumption (maximum)</b>	0.9W
<b>Weight</b>	250g
<b>Permissible operating temperature</b>	0 to 45°C
<b>Permissible relative humidity</b>	10 to 90%

## Compatibility

		Gas-fired boilers							Oil-fired boilers						
		COMBI					SYSTEM ^		REGULAR	COMBI	SYSTEM	REGULAR			
		CDi Classic	CDi Compact	Si Compact	i Junior	Highflow CDi	CDi Classic System	27i System and 30i System	12i System and 24i System	27Ri and 30Ri	Heatslave II	Heatslave II External	Danesmoor System	Danesmoor	Danesmoor WM
<b>Smart control</b>	<b>Part no.</b>														
<b>Wave</b>	7 716 192 072	✓ <sup>2</sup>	✓	✓ <sup>3</sup>	✓ <sup>1</sup>	✓	✓ <sup>2</sup>	✓	✓ <sup>3</sup>						

^With optional integral diverter valve.

1 Manufactured after July 2013.

2 Manufactured after 16th January 2007 with software version CF12.10 onwards.

3 Manufactured after February 2011.

Correct at time of printing. For the latest list of compatible boilers see the Worcester website.







### Quick to install

The Wave is quick and easy to install:

- Only requires a 2-core wire connection between the control and the boiler
- All other connections are via the Wi-Fi network
- The Wave does not need an external wired sensor unlike standard weather compensation controls
- The Wave uses online data which significantly reduces installation time and cost to the end user.

### Simple to use, providing an easy handover

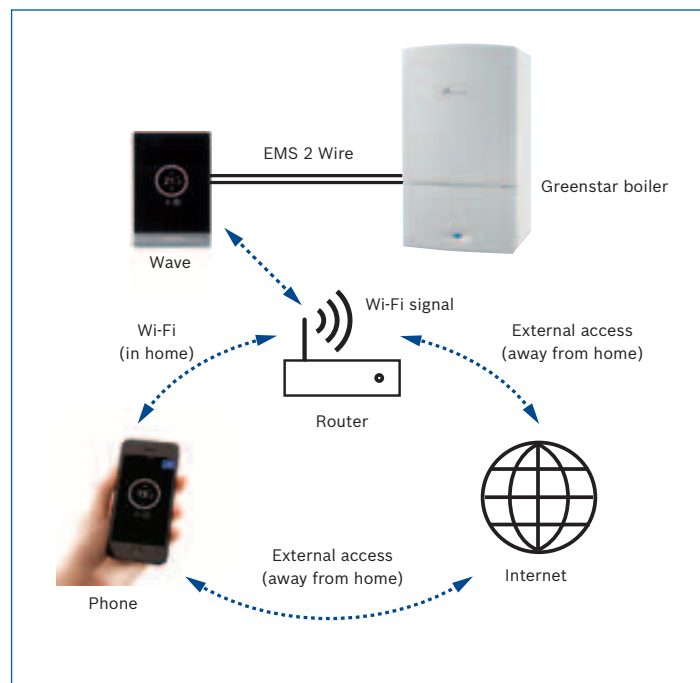
The Wave's intuitive and modern design ensures it is very simple to operate using either its in-built touchscreen or the app from wherever you are. Each unit is supplied complete with written instructions for an easy handover. In addition, short instructional videos can be viewed via the app.

When updates to the Wave software are released the controller and app will be updated automatically and completely free of charge.

If you lose your internet connection, the Wave will continue to operate as an intelligent heating and hot water controller, using the last saved programme settings.

### Features and benefits

- Only a low voltage 2-core wire connection between the controller and the boiler
- Easy to install, all other connections are via the Wi-Fi network
- Remote control of heating AND hot water via app
- Programme the heating system from outside the home
- Load and weather compensation via the internet (no outdoor sensor required)
- Allows the boiler to modulate its performance to meet the needs of each household
- Intuitive and modern design
- Ensures easy programming and control of the boiler, resulting in a simple hand over with the end-user
- Energy graphs, presence detection and many more features come as standard
- Ensures increased comfort and energy savings
- No subscription fees or chargeable app add-ons
- One-off cost.



### Wave compatible devices\*:

- Apple® devices running iOS 5.1 and higher
- Android™ devices running 2.2, 2.3 or 4.0 and higher



\*Correct at time of printing. For the latest list of compatible boilers see the Worcester website.

# Installing and commissioning the Wave smart control

## Installation

To install a Worcester Wave all you need is:

- Worcester Wave control
- Worcester compatible boiler
- Wi-Fi enabled broadband router – 802.11 b/g
- Wave app on a compatible Apple® or Android™ device.

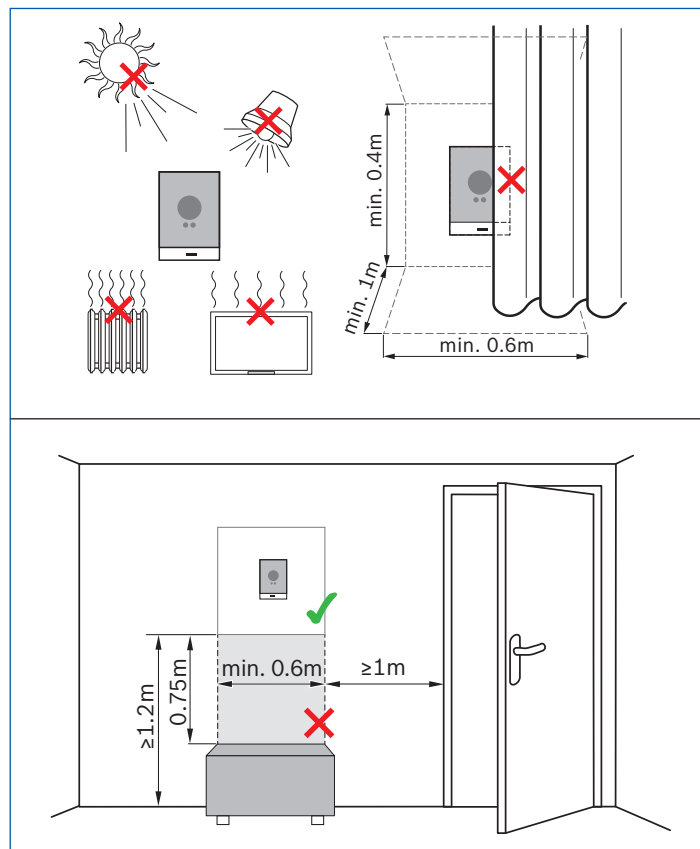
The thermostat must be fitted to an interior wall and ensure there is sufficient free space around the thermostat. The wall mounting plate can be fitted directly onto the wall, for example in the location of the previous thermostat. The Wave connects to the boiler's EMS BUS connections only. **Under no circumstances must the thermostat be connected to the boiler's 230 volt connections or external 230 volt supply.**

## Commissioning

Comprehensive installation and commissioning instructions can be found within the installation and user instructions supplied with the unit. In addition, step by step videos can be seen on our You-Tube site

[www.youtube.com/worcesterboschgroup](http://www.youtube.com/worcesterboschgroup)

## Siting



Selecting the installation location

# Total training experience from Land's End to John O'Groats

Worcester has always been committed to setting the industry standard for expert professional training and this is reflected in the scope and content of the courses, venues and options available.

We offer training on our entire range of domestic and commercial heating technologies as well as industry-led courses. All tuition is handled by expert heating specialists, combining classroom theory with, practical hands-on experience. Keep up-to-date with legislation and experience hands-on-training with our new technologies.

To increase your skills, expertise and value in the market place, trust Worcester's unique and proven total training concept.

## Training centres throughout the UK

### **Worcester**

Worcester's award-winning, state-of-the-art Training Academy is an innovative and spacious high tech training arena at our headquarters in Worcester. Facilities include open-plan domestic training areas with life-size single-storey brick buildings. Here installers can get to grips with Greenskies solar thermal systems working with Greenstar gas appliances, clearly demonstrating the importance of system design and operation.

### **Wakefield**

Opened in Summer 2013, the Wakefield Training and Assessment Academy boasts a large gas laboratory which features our entire range of Greenstar gas-fired appliances, a flushing area, wet and dry boilers and a light commercial area with a cascade of Worcester GB162 boilers. It also contains a heat pump room with a full range of Greenstore ground source, Greensource air source and Greenstar Plus hybrid heat pumps with a courtyard for all external components. There is a solar room with fully working components from our entire Greenskies solar range and a pitched roof for practical training, as well as a large commercial training room.

### **West Thurrock and Clay Cross**

Further academies are located at West Thurrock in Essex and Clay Cross in Derbyshire, both of which offer a comprehensive choice of courses.

## College-linked Learning

As well as offering training at our own centres, Worcester has established close partnerships with many colleges around the UK, equipping them with our latest products.

Worcester has worked closely with leading colleges and independent training centres for more than 20 years – a successful enterprise which in 2007 was enhanced further with the launch of the College Links Learning Scheme.

## Mobile training

We can also bring training to you. We have mobile vehicles fully equipped with operational Greenstar gas-fired boilers, dry strip-down models and even a Greensource air to air heat pump. Our 7.5 tonne mobile oil vehicle is also available for hands-on oil product training and OFTEC assessments.

**Call now for more information 0330 123 0166.**



# Gas-fired product courses

As a market leader in gas-fired condensing boilers, we aim to ensure the highest levels of competence and expertise in the installation of all Worcester Greenstar gas-fired products. We run intensive training courses for installers, commissioning engineers and operatives involved with servicing and fault finding.

Our comprehensive gas-fired condensing boiler training courses include product overview, inspection and cleaning of components, CO and CO<sub>2</sub> analysis of flue gas, removal of compact hydraulics, service mode functions and fault finding on 'live and demo' appliances.

## Gas-fired condensing boiler courses

- **Greenstar CDi Classic gas-fired condensing combi boilers.**
- **Greenstar CDi Compact and Greenstar Si Compact gas-fired condensing combi boilers.**
- **Greenstar i Junior gas-fired condensing combi boilers.**
- **Greenstar system & regular gas-fired condensing boilers.**
- **Greenstar Highflow CDi & FS CDi Regular floor standing gas-fired condensing combi and regular boilers.**
- **Greenstar Controls** (covers MT10, MT10RF, NEW Greenstar Comfort range, NEW Wave internet connected room thermostat, FR10, FR110, FW100, and ISM1).

	Greenstar Overview	CDi Classic	CDi Compact & Si Compact	i Junior	System & Regular	Highflow CDi & FS CDi Regular	Controls
Duration	1 Day	1 Day	1 Day	1 Day	1 Day	1 Day	1 Day
Cost	Free*	Free*	Free*	Free*	Free*	Free*	Free*
Training course covers							
Specification	✓	✓	✓	✓	✓	✓	Guide to the varied range of control options that are available
Installation	✓	✓	✓	✓	✓	✓	
Commissioning	✓	✓	✓	✓	✓	✓	
Servicing	✓	✓	✓	✓	✓	✓	
Maintenance	✓	✓	✓	✓	✓	✓	
Course locations							
Worcester	✓	✓	✓	✓	✓	✓	✓
Clay Cross	✗	✗	✗	✗	✗	✗	✓
Wakefield	✓	✓	✓	✓	✓	✓	✓
West Thurrock	✓	✓	✓	✓	✓	✗	✗
College Links†	✓	✓	✓	✓	✓	✗	✓
Mobile†	✓	✓	✓	✓	✗	✗	✓

\*A holding fee of £65 applies to free courses and is refunded on attendance of the course. If a booking is cancelled more than 10 working days before the course date, the fee will be fully refunded. The fee is non-refundable if a cancellation is made less than 10 working days before the course date.  
 †Please contact Worcester Training for specific colleges and mobile dates.





# Additional product and industry training courses

The diversity of products in today's heating industry gives you the opportunity to expand your expertise, whilst offering more choice to your customers. Worcester provides comprehensive training from all its academies on its entire range of technologies. Call us on **0330 123 0166** to order a full course training brochure or to book yourself onto a training course, alternatively, you can visit [www.worcester-bosch.co.uk/training](http://www.worcester-bosch.co.uk/training)

## Oil-fired product courses

- Greenstar Danesmoor & Heatslave II high efficiency condensing oil-fired boilers.
- Oil advanced fault finding.
- OFTEC 50.
- OFTEC 101/105e, OFTEC 600a and OFTEC 101/105e/600a.

## Renewable product courses

- Renewables overview.
- Greenskies solar.
- Greenskies advanced solar.
- Introduction to heat pumps.
- Greenstore LECP ground source heat pumps.
- Greensource air to air heat pumps.
- Greensource air to water heat pumps.
- Greensource split air to water heat pumps.

## Worcester commercial product courses

- Greenspring CWi47 water heater.
- GB162 overview.
- GB162 domestic.
- GB162 commercial.
- Greenstar Heat Distribution Unit.
- Commercial ACS training and assessment – CODNCO1.

## Bosch commercial product courses

- GB312 & GB402 overview.
- Solar thermal product overview.
- GWPL Gas Absorption Heat Pumps overview.
- CHP overview.
- Commercial controls overview.

## Industry focused courses

- Hot water systems & safety.
- Chemical water treatment.
- Construction skills F-Gas training/assessment certification.
- IDHEE domestic heating design.
- Domestic ACS training and assessment – reassessment. CCN1 + 3 appliances.
- QCF Level 3 Award
  - Air source and ground source heat pumps.
  - Air to water and split air to water heat pumps.
  - Solar thermal.
- MCS Made Easy.
- Green Deal.
- LPG Changeover.
- WRAS Water Regulations.





# A complete after-sales service

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

## Worcester Contact Centre

Should you require support, our award winning Contact Centre team, 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.

**Tel: 0330 123 9559**

## Opening times

Monday – Friday: 7.00am – 8.00pm

Saturday: 8.00am – 5.00pm

Sunday: 9.00am – 12 noon

Bank Holidays: 8.00am – 4.30pm



## Spares

Genuine replacement parts for all supported Worcester products are readily available from stock, or on a next day delivery basis. Visit [www.worcester-bosch.co.uk/spares](http://www.worcester-bosch.co.uk/spares) to find your local stockist.

## Customer Technical Support

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

## Technical Support

**Tel: 0330 123 3366**

**Fax: 01905 752 741**

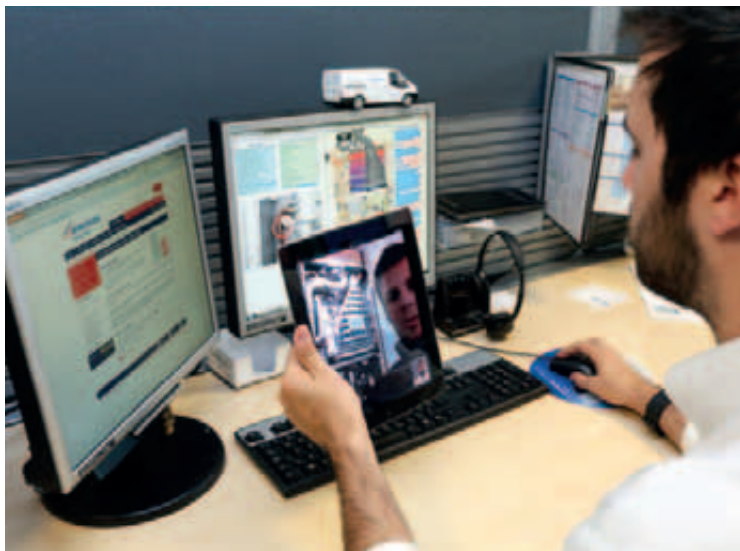
**Email: [technical-advice@uk.bosch.com](mailto:technical-advice@uk.bosch.com)**

## Opening times

Monday – Friday: 7.00am – 8.00pm

Saturday: 8.30am – 4.00pm

Bank Holidays: 8.00am – 4.30pm



# Notes



# Useful numbers

## Sales

Tel: 0330 123 9669  
sales.mailbox@uk.bosch.com

## Spare Parts

Tel: 0330 123 9779  
spares.mailbox@uk.bosch.com

## Technical Helpline (Pre & Post Sales)

Tel: 0330 123 3366  
technical-advice@uk.bosch.com

## Renewables Technical Helpline

Email: renewable-advice@uk.bosch.com  
or telephone 0330 123 9229

## Training

Tel: 0330 123 0166  
training@uk.bosch.com

## Literature

Email: brochure-request@uk.bosch.com  
or download instantly from our website  
or telephone 0330 123 9119

# Customer Service

## Engineer Appointments

Email: service-appointment@uk.bosch.com  
or telephone 0330 123 9339

## Service Enquiries

Email: service-enquiries@uk.bosch.com  
or telephone 0330 123 9559

## Guarantee Registration

To register your Worcester guarantee,  
please visit our website  
[www.worcester-bosch.co.uk/registration](http://www.worcester-bosch.co.uk/registration)  
or telephone 0330 123 2552

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These rules apply to calls from any type of line, including mobile, BT, other fixed phone line or payphone. Calls from mobiles and some other networks may vary.  
Calls to and from Bosch Thermotechnology Ltd may be recorded for training and quality assurance purposes.

# worcester-bosch.co.uk



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