

Worcester Bosch Greenskies FK240 Solar Installation

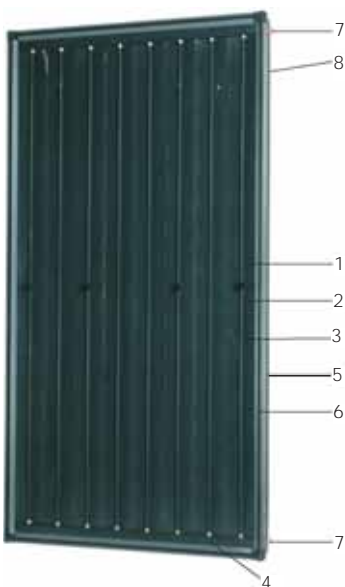
Worcester's Greenskies solar panels were launched in 2005 as a sustainable method of heating hot water for homes. They are designed to be used with heating systems that have a hot water cylinder in order to store the energy collected by the panels. Here Tony Nott, Product Manager of New Technologies for Worcester explains a little more about the simple but effective technology behind Greenskies.

The panels have been designed specifically for the northern European weather that the UK receives. As such the panels benefit from a selective coating which means they are not dependent solely on sunny days to produce worthwhile results. The collectors work with direct and diffuse sunlight enabling them to make a valuable contribution to hot water heating throughout the year and make the most of UK weather.

Technical data table

Classification Worcester Greenskies FK240 Solar Panel

Panel height	112mm
Panel width	1,135mm
Panel length	2,115mm
Weight (empty)	43kg
Fluid content	1.15 litres
Gross surface area	2.4m ²
Net surface area	2.1m ²
Stagnation temperature	181°C
Max operation pressure	3 bar
Min efficiency	525 kWh/m ² a
Absorption	95%
Emission	12%
Glycol freezing temperature	-38°C
Max collectors in series	9



Key to components

Installers should be aware of the key components that make up the panels.

- 1 - Highly transparent, hardened solar glass
- 2 - Selective coated copper absorber
- 3 - Heat transfer tubes
- 4 - Main collector pipe
- 5 - Surrounding tray - UV resistant 2-layer plastic
- 6 - Glass fibre frame
- 7 - Pipework connections
- 8 - Temperature-measurement point (Thermostat Pocket)

Operation

The panels are usually mounted on a roof, or other surface, which has been selected for its direct exposure to sunlight, with a preference for a south facing orientation. This maximises the potential number of hours throughout the year that the panels can be exposed to sunlight. The energy in the

sun's rays is absorbed by the panel and the heat generated is transferred into the pipe work in the absorber. The pipe work is filled with a ready-mixed liquid, consisting of glycol and water, which is circulated by a pump to the lower coil in the hot water cylinder. The heat is deposited in the cylinder and the glycol returns to the panel to absorb more free solar energy. The Worcester Greenskies system is equipped with a simple unit to control the flow of energy from the panels to the storage cylinder.

Versatility

Worcester offers all of the parts to make up a complete package (with the exception of the solar cylinder and ancillaries) for a solar water heating solution as an addition to an existing or replacement boiler. In addition the solar panels can also be used for other water heating requirements such as heating of swimming pools and can be used with space heating of suitable systems. In the event that a pitched roof is unsuitable the panels can be mounted on a frame for use on flat roofs or other surfaces.



The solar panels should ideally be installed in a southerly direction at an angle of between 30 and 45 degrees. Where this is not possible the installation should move towards a westerly facing direction. East and North facing

directions should be avoided because of the reduction in the hours of sunlight to which the panel will be exposed over the year.

Panel performance

Each Worcester Greenskies FK240 panel has a net surface area of 2.1sq m with a yield of 525kWh per square meter annually under typical conditions. The panels are covered with a special solar glass, which increases the ease with which the light is able to reach the collector surface and helps the panels to achieve absorption of 95% of the available energy.

The panels emit only 12% of this energy partly due to a 60mm layer of mineral wool which insulates the rear of the collector.

A common question from installers about solar concerns

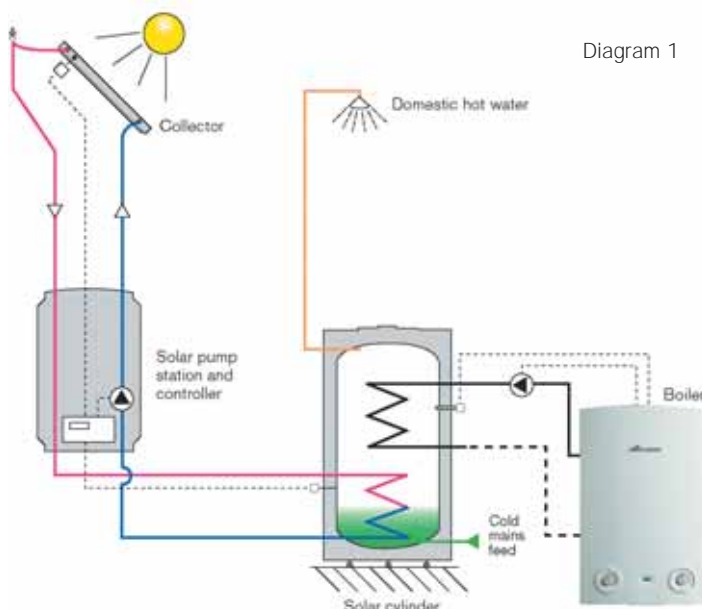
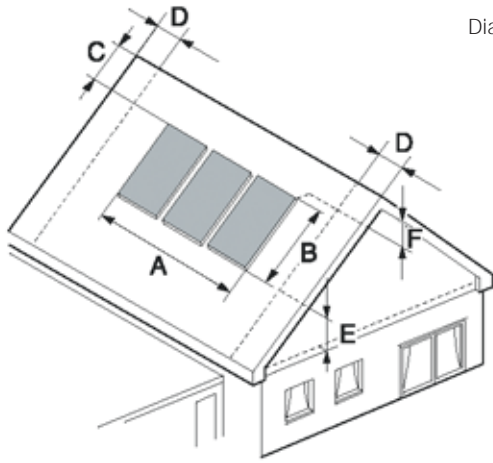


Diagram 1

Diagram 2



Space required for collector array

No. of collectors	Dimension A	Dimension B
2	2.34m	2.20m
3	3.51m	2.20m
4	4.68m	2.20m
5	5.85m	2.20m
6	7.02m	2.20m
7	8.19m	2.20m
8	9.36m	2.20m
9	10.53m	2.20m

Space requirement

whether there is enough sun in the UK to make the installation of solar worthwhile. The usual idea of British weather is of cloudy skies with intermittent sunshine. The panels have been developed with this typical weather in mind and make the most of both direct and diffuse sunlight to give a useful annual contribution.

System Layout

The most common solar system layout uses a twin coil cylinder, which is fed by both a boiler (or other heat source) and the solar panels (see diagram 1). The solar system and the regular heating system do not come into direct contact with each other and the only shared part is the cylinder. The solar system has its own pump, expansion vessel, pressure relief valve, air vent and controller.

Planning

Planning requirements should always be checked with the local authority prior to beginning on the solar installation. Requirements vary from one authority to the next. In general the installation of solar panels, as far as planning permission is concerned, is reasonably straight-forward. Most local authorities regard the panels in a similar vein to flush fitting roof-light windows, and so planning permission may not be required.

Site preparation/portability

The panels need to be sited at 30-45 degree tilt, ideally facing south and away from sources of shade. Particular attention should be paid to site access and the safe installation of the panels. When working at height the required safety equipment should be correctly used.

Panel dimensions and clearances

Dimension A and B correspond to the area required for the selected number and layout of the panels. (see diagram 2)
Dimension C signifies at least two tiles to the ridge. A space

of the equivalent of two tiles should be allowed for to avoid damage at the roof ridge, particularly if the tiles are laid in mortar.

Dimension D shows the roof height including the gable wall. The adjacent 50cm clearance to the collector array is required under the roof on the right or left depending on the type of connection.

Dimension E represents at least 30cm, which is required in the loft for installation of the connection pipes.

Dimension F corresponds to at least 40cm, which is required in the loft for installation of the connection pipes.

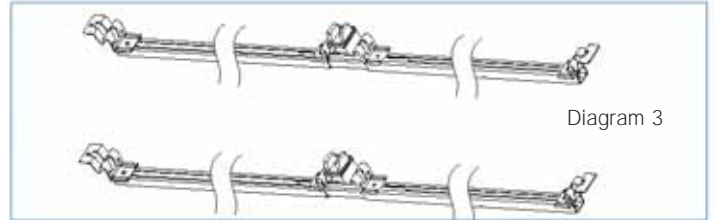


Diagram 3

Preassembled profile rails for two adjacent collectors

Panel support assembly

Each panel is secured onto a pair of rails, which can be assembled on the ground and then raised to the roof. The rails can then be mounted on the roof hooks, which are available to suit various roof and tile types. (see diagram 3)

In addition, the Worcester Greenskies FK240 Solar Panels are available with a support kit for installation on flat surfaces, offering greater possibilities for installation.

Connecting profile rails

Individual rails are joined with a rail connector into which the rails slide, for an easy connection. (see diagram 4)

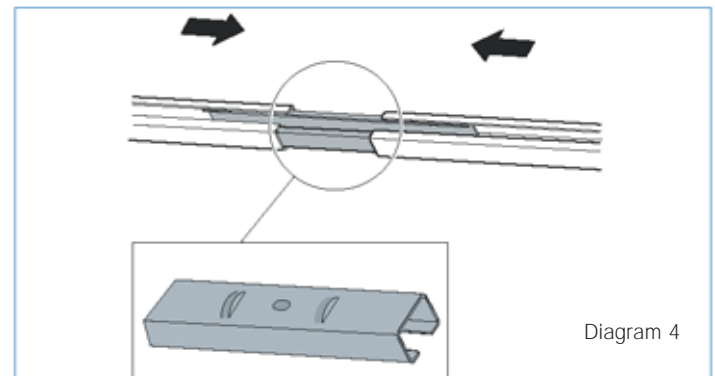


Diagram 4

Rail connection

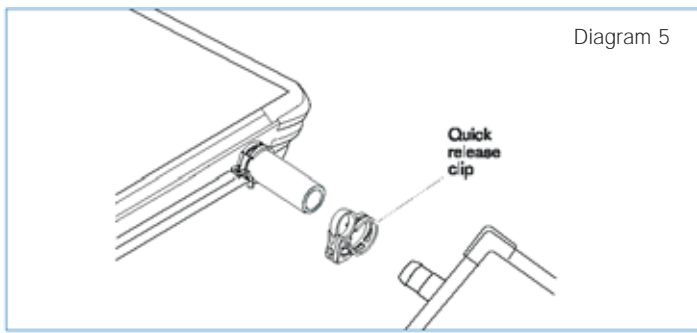
Pipework Connections

The solar panels are equipped with simple push-fit connections. These speed installation and, with bespoke flexible hoses, aid the routing of pipework into the roof space. Once inside the property the system should be run in copper pipe.

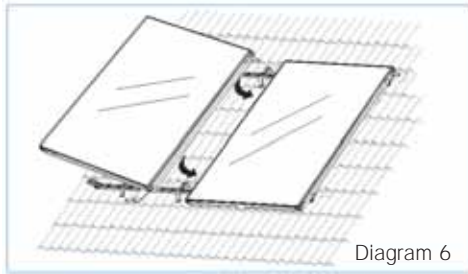
Flexible hose connections are secured with a simple quick release clip which closes automatically and allows the time required for pipework connections on the roof to be reduced. (see diagram 5)

Subsequent collectors in series also use this connection method to enable arrays to be plumbed in with ease. The second panel (of a two panel array) can be added easily with push-fit connections (see diagram 6).

The UK market for solar is, at present, relatively untapped. According to the European Solar Thermal Industry Federation



(ESTIF) the solar thermal market in Europe grew by 12% in 2004, however, the UK has a long way to go to match other European countries, especially Germany, which accounted for 47% of the European market. The UK accounted for only 2%. With the growing awareness of solar thermal and financial assistance available in government grants the UK contribution to the total European market is set to increase. Installers that are looking to offer fuel saving solutions to their customers as well as expand their business offering should seriously consider supplying solar.



Cylinders

To make the most of summer sunlight and the higher potential energy gains, a two panel system should ideally be combined with a 300 litre cylinder. Where this is not possible, for example where insufficient space is available, a recommended minimum of 200 litres storage can be used.

Installation requirements

The installation of the system must be carried out in accordance with the relevant requirements for safety, current Wiring Regulations, local Building Regulations, Building Standards (Scotland), (Consolidation) Regulations, Water Regulations and Health and Safety document No. 63S (Electricity at Work Regulations 1989).

Electricity supply

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

Glycol heat transfer liquid

Worcester Greenskies FK240 Solar Panels and system components should be used only with the recommended heat transfer liquid -- TyfocorCL manufactured by Tyforop Chemie GmbH. The heat transfer liquid uses a proven concentration of anti-freeze and water to give protection against freezing and provide optimum performance from the panels and system.

Hot water blending valve

It is recommended a thermostatic blending valve be used in conjunction with the solar cylinder in order to guard against the high hot water temperatures, which the system can provide.

Insulation

Exposed pipework should be covered with insulation rated to 150 degrees centigrade due to the high temperatures that the panels are able to generate.

Controls

The solar package includes a simple controller (TDS10), which allows the user to select the temperature required at the hot water cylinder. The controller then automatically decides when to run the pump to bring the energy from the panels to the cylinder.

The control uses a simple temperature differential to define when the pump runs. The temperature in the panel must be 8 degrees higher than the store for the pump to start running. This will continue until the panel temperature is 4 degrees above the store and then the pump will stop. This ensures that the pump is running only when the benefit from the solar panels is available.

Pressure relief valve

The AGS2 Solar pump station in the Worcester Greenskies FK240 solar package is equipped with a 3 bar pressure relief valve which should be connected to pipe work terminating in a suitable container. An empty canister of heat transfer fluid can be used for this purpose.

Solar Radiation in the British Isles

The UK actually receives around 65% of the amount of solar radiation that is received by the south of Spain. Summer as expected will provide the largest amount of radiation over the year but a useful contribution will be provided by other seasons. The contribution towards the hot water requirement over the year changes with the hours and intensity of daylight so, as an indication, a well-sized typical installation will provide 80-90 per cent during summer, 40-50 per cent during spring and autumn and 20-30 per cent during winter.

This translates to roughly half of the typical annual domestic hot water requirement over a 12 month period.

If this article has peaked your interest why not take it a step further? Worcester also offers a one-day training course on solar installation. For more details log onto www.worcester-bosch.co.uk or call 01905 752526.



This article, was first published in the MAY/JUNE 2006 issue of P&HE magazine and has been reproduced with the kind permission of Worcester, Bosch Group.

