



# SOLAR RANGE

Solar thermal water heating  
systems





At Grant we have been designing and manufacturing reliable and easy to install heating products for four decades. From award winning oil-fired condensing boilers to the latest renewable technologies, our heating systems have a reputation for quality that is second to none.

We combine precision engineering, innovation, performance and value for money to produce sustainable heating solutions that are trusted by both installers and householders.

### **Quality Design**

There is never a compromise on quality. We design all of our products so that you can be sure that the durability and efficiency are sector leading. We continually develop new technologies and use only the best materials to ensure our products exceed all performance and environmental standards.

Our belief in simple solutions ensures that, while our technology is sophisticated, our products are low maintenance and easy to install. For a high quality, reliable and sustainable heating system, trust in Grant.

### **Heating Responsibly**

Grant manufacture heating systems that respond to the challenges of rising fuel costs whilst protecting our environment. Environmental responsibility is central to all we do and we continue to develop and innovate to produce even more efficient products that make best use of our natural resources.

We are passionate about developing sustainable, high-performance and affordable alternatives for heating homes into the future.

### **Our Guarantee**

The Grant label is a guarantee of reliability, quality and value. We put our customers first and our independence ensures that we can monitor our standards and processes to deliver the very best quality and service.

That's why, when you order your system from a Grant stockist, you can be sure of a tailored service and excellent after sales support.

# Solar Technology

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## Fit for the future

Utilising the power of the sun is an excellent alternative to traditional energy sources.

With zero CO<sub>2</sub> emissions and an inexhaustible supply of sunshine (even in the UK!) solar technology is good for the environment and is an excellent way for homeowners to reduce their carbon footprint as part of a wider lifestyle choice.

Adding solar heating technology to a property also increases its value – houses with solar heating are less prone to the fluctuation in heating prices, making them an attractive option for potential buyers.

## Why solar thermal?

Solar thermal is a clean and sustainable method of providing homes with hot water. As with all Grant products the technology is simple but highly efficient, providing an environmentally responsible and cost effective alternative to traditional energy sources.

The basic principle is easy to explain. If you leave a garden hose on the ground exposed to the sun, in a short time the water within will become hot. Solar thermal collectors work in very much the same way, only more efficiently. Roof-mounted solar collectors are connected to a system containing a special glycol/water solution. This heated fluid is circulated from the panel to a cylinder where the heat is transferred to produce hot water.

Typically, a solar thermal system can save you up to 70% on your annual hot water heating costs – so it's good for the planet and good for your wallet too!

## The benefits of Grant Solar Thermal

Grant Solar provides an efficient and environmentally responsible solution to the use of fossil fuels.

All our products and components are rigorously tested to ensure the highest standards of quality and reliability and over time deliver significant cost savings.

Grant Solar collectors can be installed on sloping roofs using either an on-roof or in-roof mounting system or on flat roofs if required, and the use of self-cleaning glass means maintenance is kept to a minimum.

- Lowers CO<sub>2</sub> Emissions
- Dramatically reduces annual fuel bills
- Solar Keymark approved
- Eligible for RHI payments
- On-roof, in-roof and flat roof mounting options
- 82.6% Collector efficiency

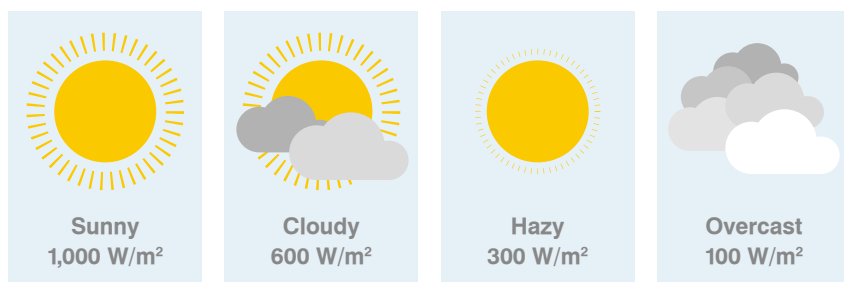
## Solar Thermal **Overview**

The Grant Solar Thermal range includes a high efficiency flat plate collector, multifunctional controller with LCD display, in-roof, on-roof and flat-roof mounting arrangements, the unique Grant CombiSOL to integrate solar thermal with combination boilers and the Grant WinterSOL that provides a fully heated cylinder of hot water during periods of low thermal gain.



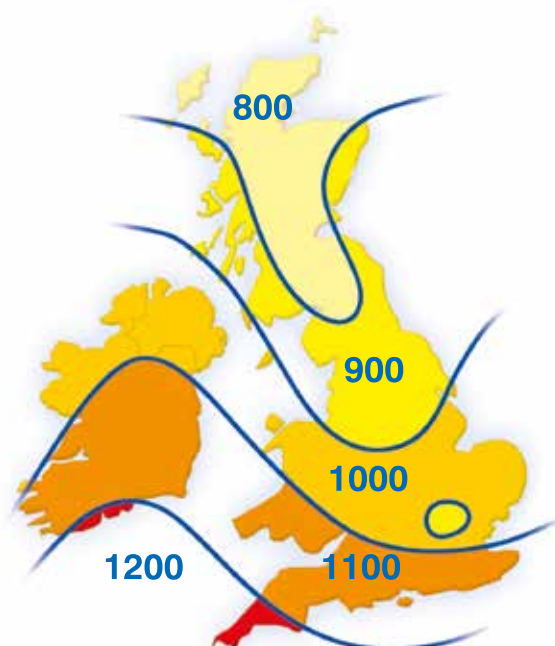
### **Free energy!**

Many people believe that solar collectors only work in the summer, however this type of free energy is available throughout the year. From May to September, solar thermal could produce 100% of the energy required for heating your domestic water (see below). Grant collectors operate not just with direct sunlight, but also diffused sunlight, so they even work on cloudy days. On average Grant Solar can provide up to 70% of your hot water needs per year, for free!



### **Solar irradiation in the UK and Ireland**

This diagram shows the total average solar radiation falling on 1m<sup>2</sup> surface, inclined at 30° to the horizontal, measured in kilowatt-hours. The average property requires approximately 3,000 kWh per year for domestic water heating.



## Collector overview

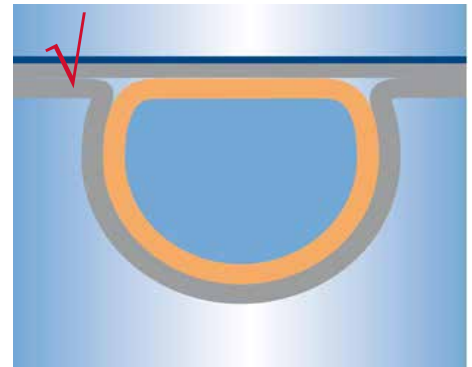
The Grant Sahara collector has a durable aluminium frame with a bronze anodised finish, which has been designed to blend with most domestic roof types.

During the manufacturing process, the use of premium materials guarantees the collectors' reliability and durability. Grant collectors have been tested to the requirement of BS EN 12975 and are certified with the Solar Keymark.

## Heat Transfer Technology

Grant use a unique patented system where the heat transfer sheet interlocks both the pipe and absorber for perfect thermal transfer. Additional aluminium plates enclose the copper pipes and combined with an industrial strength adhesive result in 360° heat transfer (see diagram 1). Examples shown in diagrams 2 (Soldered absorber) and 3 (Ultrasonic welded) provide far less contact, making these options less efficient and more prone to water damage.

1. Grants unique patented heat transfer system

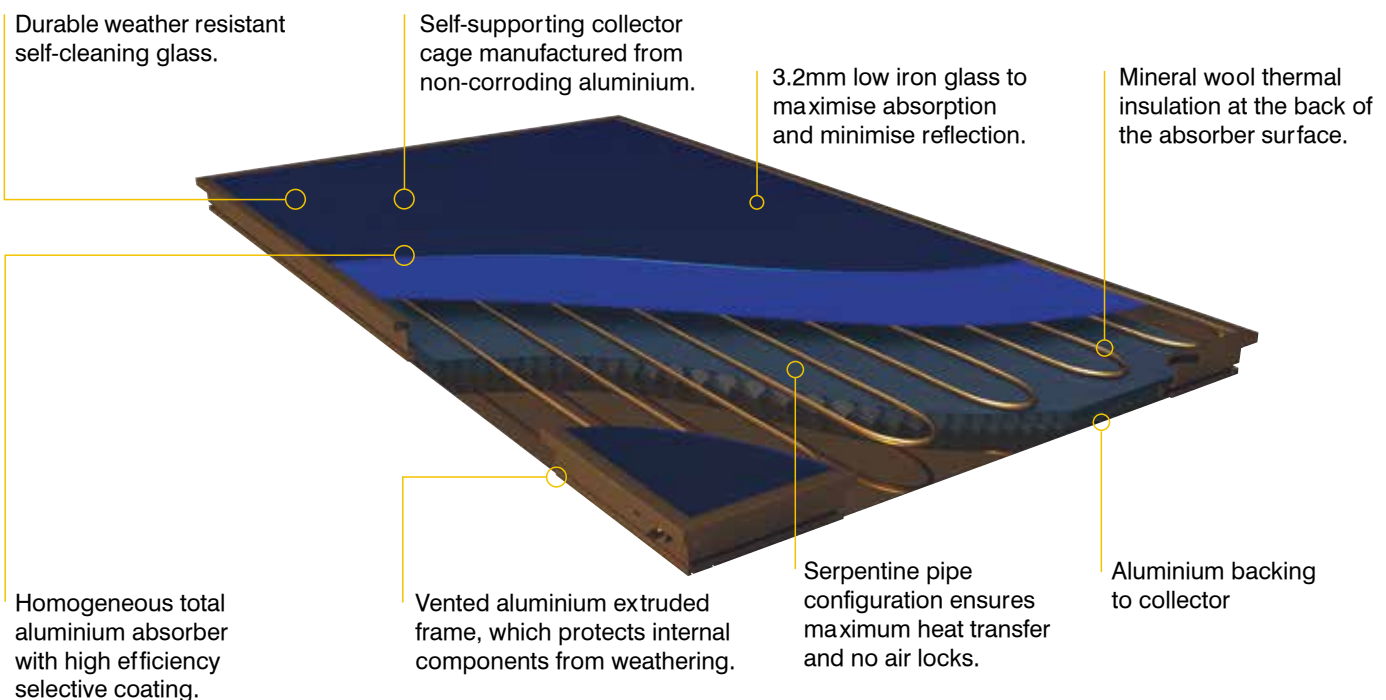


2. Soldered absorber



3. Ultrasonic welded absorber

## Design

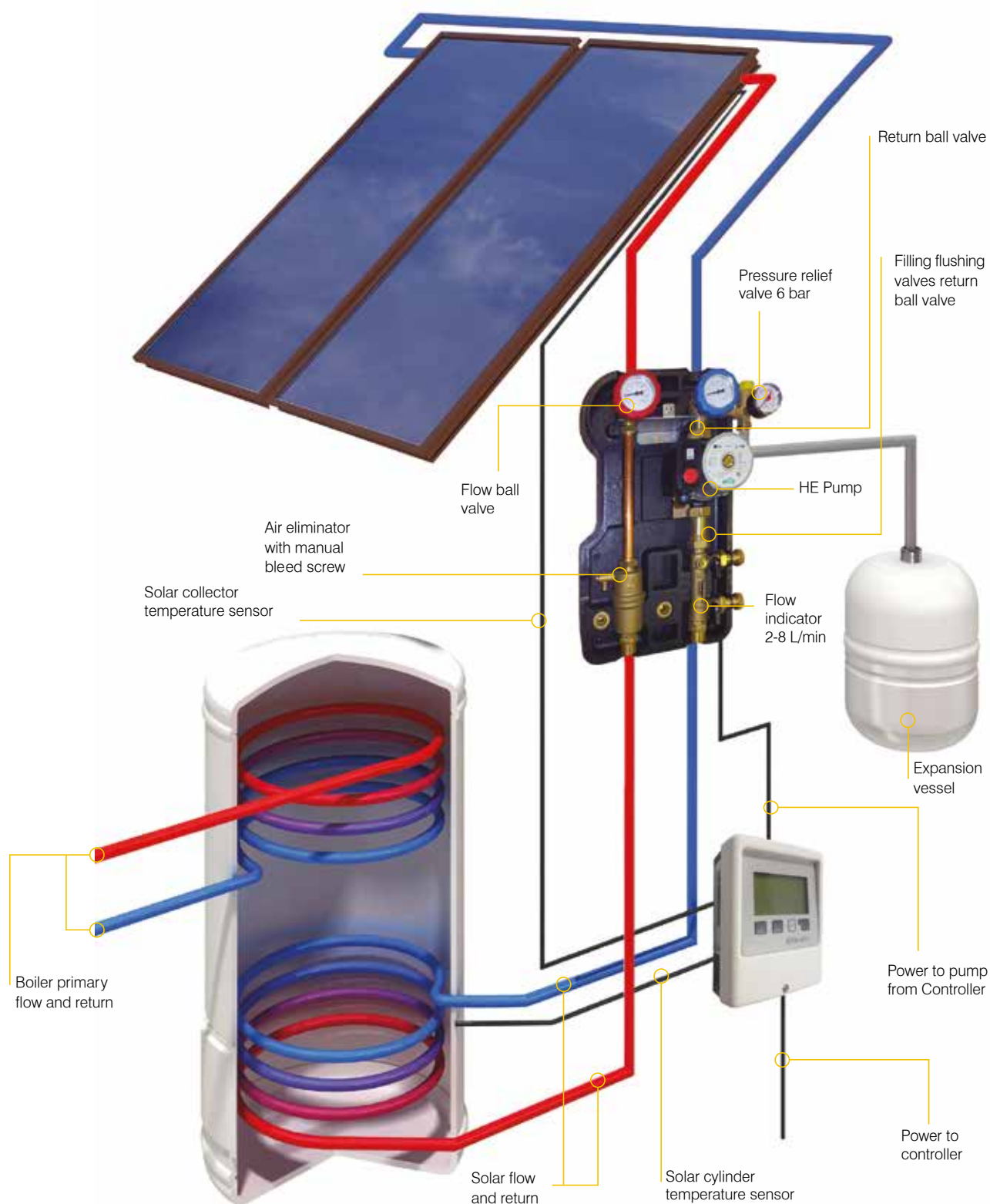


### Collector information

|                                   |                                       |                                         |                                          |
|-----------------------------------|---------------------------------------|-----------------------------------------|------------------------------------------|
| Dimensions (L x W x D)            | 2043 x 1143 x 80mm                    | Linear heat loss coefficient ( $a_1$ )  | 4.441 W/(m <sup>2</sup> K)               |
| Collector gross area              | 2.34m <sup>2</sup>                    | Linear heat loss coefficient ( $a_2$ )  | 0.008 W/(m <sup>2</sup> K <sup>2</sup> ) |
| Aperture/absorber area            | 2.14m <sup>2</sup>                    | Stagnation temperature*                 | 177°C                                    |
| Weight                            | 40kg                                  | Maximum operating pressure              | 10 bar                                   |
| Glass type                        | ESG, Durasolar P+ Sandy               | Fluid content                           | 1.6 litre                                |
| Glass thickness                   | 3.2mm                                 | Tilt angle (minimum/maximum)            | 20° / 90°                                |
| Zero Loss efficiency ( $\eta_0$ ) | 0.826 (82.6%)                         | Pressure drop (at 2.5l/min solar fluid) | 105mbar                                  |
| Effective thermal capacity        | 12620KJ/m <sup>2</sup> K <sup>2</sup> |                                         |                                          |

\*Test conditions - Irradiance 1000W/m<sup>2</sup> Ambient temperature 30°C

## Solar Thermal System



Grant Solar Thermal can integrate easily with conventional water heating systems. Installation typically takes a couple of days to complete.

The pump station incorporated in the diagram above features an air eliminator that allows the system to be both filled and purged of air in a single operation. Unlike other arrangements there is no need to install an air vent on the roof and also no need for frequent maintenance.



## Ease of ordering

To make life as straightforward as possible, Grant have introduced a series of individually numbered kits that meet most installation requirements. These simply consist of Sahara collectors, a roof mounting system, expansion vessel, pump station, control panel, pipe connections and solar fluid.

## Designing your system

Grant Solar collectors have an absorber (or nett) area of 2.14m<sup>2</sup>. As a rule of thumb, when sizing a system, you should allow 1.0-1.3m<sup>2</sup> of nett collector area, per person.

Cylinder requirements are 50-60 litres capacity per m<sup>2</sup> of nett collector area. To simplify this, for a 2-collector system of  $2 \times 2.14 = 4.28\text{m}^2$ , you would require a cylinder of approximately 200-250 litres. This should be sufficient for 4 people and satisfy up to 70% of your hot water demand per annum.

## Things to consider:

- Location of building
- Orientation of building
- Angle of inclination (roof)
- Shading of collectors
- Collector array in m<sup>2</sup>
- Hot water requirements
- Size of cylinder
- Pipe work requirements

| How to calculate the number of collectors required |                                                  |                                |   |   |   |
|----------------------------------------------------|--------------------------------------------------|--------------------------------|---|---|---|
| Direction of roof                                  | Solar radiation kWh/Year<br>(see map on page 04) | Number of people per household |   |   |   |
|                                                    |                                                  | <3                             | 4 | 5 | 6 |
| South                                              | 900 - 1000                                       | 2                              | 2 | 2 | 3 |
|                                                    | 1000 - 1100                                      | 2                              | 2 | 2 | 2 |
|                                                    | 1100 - 1200                                      | 2                              | 2 | 2 | 2 |
| South west / South east                            | 900 - 1000                                       | 2                              | 2 | 3 | 3 |
|                                                    | 1000 - 1100                                      | 2                              | 2 | 2 | 3 |
|                                                    | 1100 - 1200                                      | 2                              | 2 | 2 | 2 |
| West                                               | 900 - 1000                                       | 2                              | 3 | 3 | 4 |
|                                                    | 1000 - 1100                                      | 2                              | 2 | 3 | 3 |
|                                                    | 1100 - 1200                                      | 2                              | 2 | 2 | 3 |
| East                                               | 900 - 1000                                       | 2                              | 3 | 3 | 4 |
|                                                    | 1000 - 1100                                      | 2                              | 3 | 3 | 3 |
|                                                    | 1100 - 1200                                      | 2                              | 2 | 2 | 3 |

# Solar Thermal Components

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## Solar controllers

The Grant GSX1 and GSD3X differential temperature solar controllers automatically manage the operation of the solar thermal system.

Monitoring the temperature in both collector and cylinder, they operate the circulating pump only when the difference in temperature will provide efficient heating of the hot water. They will also stop the circulating pump if the temperature in the collector exceeds the maximum set or, if the cylinder has reached the required temperature.

The new GSX1 controller is used for simple systems, where collectors are located on the same side of a roof - such as with a south facing installation, whereas the GSD3X is utilised for more complex projects, where collectors are facing the different directions, located on either the side of a roof - such as with an East/West facing installation. Both solar controllers monitor and display the amount of solar power produced by the system on a daily and cumulative basis. The controllers can display the collector and cylinder temperatures and also incorporate a pump kick facility which activates the pump for a short period each day to prevent the possibility of seizure if not operated for more than 24 hours.

## Expansion vessel

Available in 18 and 25 litres, the expansion vessel connects to the solar pump station by a flexible hose. It incorporates a special membrane selected to withstand the higher temperatures found in solar thermal systems.

## Solar pump station

The Grant Solar pump station has been redesigned to make it more compact. The latest version has a black cover, housing the 3-speed high efficiency circulating pump, along with all other control components and is designed for vertical wall mounting.

The flow and return ball valves incorporate temperature gauges to monitor return and flow temperatures and have integral anti-gravity brakes to prevent gravity circulation around the circuit when the pump is stopped.

The air separator with manual bleed screw allows for rapid air removal from the sealed system. The 6 bar pressure relief valve is mounted on a manifold with the system pressure gauge and expansion vessel connection.

Filling and flushing of the system is made easy by the combined fill and flush valve assembly and the adjustment of fluid flow rate is simple using the integral flow indicator.

## Solar fluid

The solar fluid is an odour-free, non-toxic 40/60 propylene glycol/water solution, developed specifically for solar thermal applications to protect systems from freezing.

The nitrate, phosphate and ammonia free fluid has been formulated to remain stable over long periods of time and is also a good corrosion inhibitor. It is available ready mixed in 10 or 20 litre packs.



## Grant CombiSOL

### Integrating renewables with combi boilers

With solar thermal systems increasing in popularity in the UK and many new and existing heating installations involving mains pressure combination boilers, a simple, cost effective solution to integrate these two technologies is a must.

The Grant CombiSOL is designed to do just that, and is uniquely compatible with most combi boilers and fuel types.

It works by accurately controlling the outlet temperature of stored secondary hot water produced by a solar thermal system, directing the flow either straight to the hot water outlet, or via the combi boiler to the same outlet with a seamless changeover. There are additionally minimal temperature fluctuations at the taps.

## Compatibility

The Grant CombiSOL also accurately regulates the inlet water temperature to the combination boiler, therefore installing this unit with any combi boiler should not pose a problem, as the mixed water into the appliance is limited to a maximum of 24°C.

## Technical information

The unique thermostatic change-over valves provide a safe and simple solution for adding renewable energies to the home without having the added expense of changing your central heating appliance.

It is important to ensure that the combination boiler can accept an incoming cold mains water temperature of up to 24°C. If in doubt, contact the boiler manufacturer. Grant's extensive research and development programme has refined the use of each valve (marked clearly on the white cap) to give optimum control of hot water delivery to your taps.



## Grant WinterSOL

### A fully heated cylinder in times of low solar gain

The Grant WinterSOL has been designed to provide homeowners with a fully heated cylinder of hot water during times when there may not be sufficient solar (or heat pump) gain, therefore ensuring hot water demand is satisfied.

During the winter months, for example, 150 litres of hot water from a 300 litre cylinder may be insufficient. By fitting the Grant WinterSOL, a simple summer/winter switch can be operated by the customer, allowing the central heating boiler to heat the full contents of the cylinder. When solar gain is restored, the switch is set back to summer mode for maximum efficiency. This unit does not directly prevent solar thermal or heat pump systems from operating as it is only energised during the customers normal programmed hot water period.



# Solar Thermal Mounting Options

## Roof inclination and direction

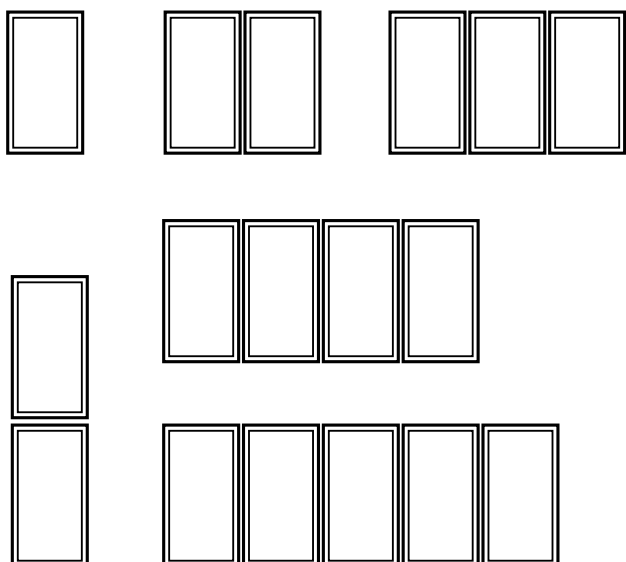
When choosing a system there are a number of factors to consider.

Almost any roof type is suitable, however a south facing arrangement could gain 100% of the solar energy available during the day. If the roof was to face south-east or south-west there will be a reduction in yield by 5-10%.

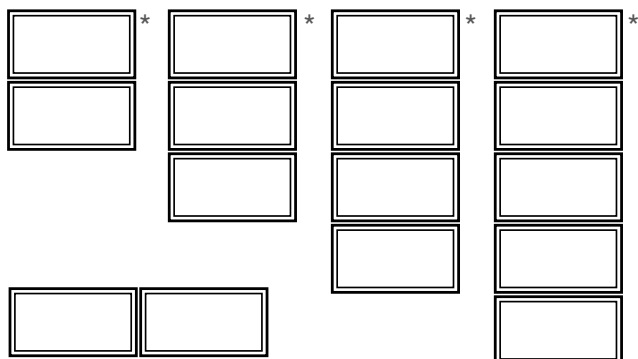
## Positioning

Collectors can be positioned on the roof either in a portrait or landscape arrangement, as shown below.

Portrait



Landscape



\*These configurations are only available as on-roof installations

Up to 5 collectors can be used in series

## On-roof

Grant Solar collectors can be quickly and easily located above the roof tiles or slates using brackets and a mounting rail attached directly to the roof trusses. This system is available with fixing brackets suitable for all roof tile types including slates, on roof pitches ranging from 20° to 90°. The on-roof mounting system is supplied as standard with any on-roof Grant Solar kit.



## In-roof

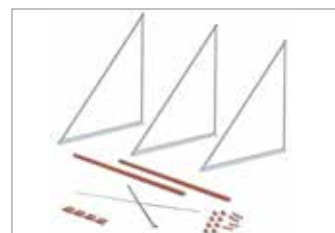
Installation of Grant Solar collectors set into the roof tiles or slates ensures a low-profile appearance. The roof surface beneath is closed within an aluminium weathering cassette incorporating flashings and drainage channels etc. In new build applications this mounting option reduces roofing costs, as tiles are not required beneath the installation.

(Note: for a roof tiled with reclaimed slate, the flashing may appear uneven. Please contact Grant UK for an alternative solution. Slate depth must not exceed 6mm).



## Flat-roof

The flat-roof system is based upon the on-roof design. The mounting rails are fitted to a rigid inclined frame structure. This method allows the collectors to be positioned quickly and easily on a flat roof.



The Wave range of cylinders and thermal stores are manufactured to the highest specifications. The cylinders are produced using high quality 1mm thick duplex 2034 stainless steel and the internal coils are manufactured from either 20mm or 25mm corrugated stainless steel tubing to deliver maximum heat transfer and recovery.

### **DuoWave Solar cylinders**

The DuoWave range of mains pressure hot water cylinders were developed to meet the growing demand for systems that combine a renewable heat source with a standard oil, gas or electric boiler. They are particularly suitable for use with solar hot water systems like Grant Solar Thermal. When correctly installed this arrangement can significantly reduce the dependence on traditional fossil fuels resulting in lower energy bills.

Sizes range from 170 litres to 500 litres, comprising five direct and six indirect models which can meet the needs of even the largest of domestic properties.

### **Design**

Direct models are designed to be electrically heated but also incorporate a high performance solar coil to allow easy connection to a solar thermal system. Indirect cylinders have two coils for connection to primary heat sources. The solar heat supply should be connected to the bottom coil, which is designed to preheat, or heat the surrounding water, depending on the temperature of the incoming supply. The central heating boiler connections should then be made to the top coil. The boiler will only operate if the water in the cylinder has not reached the desired pre-set temperature and the boiler/cylinder controls are installed and commissioned correctly.

Featuring high efficiency corrugated heating coils, the Grant DuoWave range is developed to ensure a maximum transfer of the energy collected by renewable systems. As a safety feature, indirect cylinders are supplied with a control/high limit thermal cut-out that operates at 90°C.

For further information on the Grant cylinder range please visit our website at: [www.grantuk.com](http://www.grantuk.com)



## Installation and Commissioning

The installation of the Grant Solar Thermal system must be carried out by a competent trained person in accordance with the relevant requirements for health and safety, local building regulations, building standards in Scotland and regulations and bylaws of the local water company.

Comprehensive technical information can be found in the installation instructions, which is supplied with every solar thermal system. Recent changes to legislation mean that planning permission is not required on most domestic houses, unless the property is listed, or in an area of outstanding natural beauty (Regulations subject to change).

## Guarantees

Grant Engineering (UK) Limited guarantees the manufacture of the solar thermal system including all electrical and mechanical components for a period of **twelve months from the date of installation**, unless the installation was more than six months from the date of purchase, in which case the guarantee period will commence six months from the date of purchase, provided that the system has been installed in full accordance with the installation and servicing manual issued. This will be extended to a total period of **five years** if the solar thermal system is registered with Grant Engineering (UK) Limited **within thirty days of installation** and serviced biennially. To register your boiler visit: [www.grantuk.com](http://www.grantuk.com).

In addition, the collector (panel) has a performance guarantee for a period of five years (parts only) from date of installation.

Please note that Grant UK do not guarantee mixed systems i.e. those that include parts or collectors that have been supplied by another manufacturer.

Detailed Terms and Conditions are available upon request.



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## Aftersales Service

For peace of mind, Grant VortexBlue boilers are backed by a national network of independent service engineers. In the unlikely event of a problem occurring, your installer should telephone our Customer Service Department on: **+44 (0)1380 736920**.

## Website Downloads

For further information about the Grant product range or to download our brochures please visit our website at: [www.grantuk.com](http://www.grantuk.com)

## Training Academy

At our purpose built Training Academy in Devizes we offer a wide range of training courses, including Grant product training courses, OFTEC training and assessment and Logic Hot Water Systems, and Safety and Water Regulations courses. Our facilities include air-conditioned lecture rooms and extensive oil burner and 'renewables' training and assessment workshops. Here our trainees can hone their skills on a training roof, working solar thermal and wood pellet boilers, air source heat pumps, thermal store installations, solar thermal training/assessment rigs and unvented hot water training and assessment rigs.

The training covers all aspects of the Grant Solar Thermal range including designing and planning a system, installation, operation and key features and benefits.

For further information call: **+44 (0)1380 736943**

This leaflet is accurate at the time of printing but as Grant UK has a policy of continual improvement it may be superseded. We reserve the right to amend specifications without prior notice. The statutory rights of the consumer are not affected.

All products manufactured under I.S. EN ISO 9001. Grant UK additionally holds ISO 14001 accreditation.

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