



How does Heliomotion track the sun?

The tracker has an integrated GPS module used to determine the time, latitude and longitude. Using that information it calculates the sun's position in the sky in order to follow it. To track the sun accurately, the bask must be facing exactly due south.

Is the Heliomotion tracking automatic?

The Heliomotion tracker's operation is fully automatic. When powered on the tracker goes through the following steps to track the sun.

The tracker waits until a GPS fix has been established to retrieve information needed to calculate the sun's current position: latitude, longitude, date and time. This information is recalibrated every morning. The tracker then rotates to face the sun's present position. As the sun moves across the sky the tracker follows it, moving in intervals of 1.8 degrees every 6 - 7 minutes. After each movement the tracker positions itself 0.9 degrees ahead of the sun. The tracker continues to follow the sun until sunset or until its evening position is reached, which is 90 degrees after the noon position. After sunset the tracker returns to its noon position. Before sunrise the tracker rotates counterclockwise to the position where the sun will rise, 90 degrees or less depending on the season. The tracker awaits sunrise and then repeats the sequence. If a Heliomotion installation is left without power the wind may eventually rotate the framework to morning or evening position. The end stops will physically prevent the tracker from rotating far beyond these positions.

Note that the tracker follows the sun only when it's above the horizon. This means it tracks 180 degrees during the summer half of the year and progressively less the closer the season gets to midwinter.

How much does tracking increase electricity production?

Solar tracking increases energy yield by 25-60% per year, compared with a stationary panel facing south with an ideal tilt. The energy increase depends on the latitude where the installation is located, from +25% in Hawaii, on the tropic of Cancer, to +50% in Scandinavia. The UK average is 40 - 45%. The extra energy is generated in the morning and in the evening which matches the consumption curve of a typical household much more efficiently than a static system which peaks at solar noon - often when everyone is out of the property. Systems can be used singly or in quantity as a micro grid depending on power requirements..

How is the Heliomotion solar tracker powered?

It can be powered from any constant 24 VDC power source, either using the included 24 VDC power adapter or by connecting it to a 24V battery bank. The input voltage range is 10-28 VDC. Average power consumption is 0.4 watt. (0.01kWh/day).

How much wind load is the Heliomotion designed to handle?

All Heliomotion models are engineered to withstand wind loads up to 35 metres per second – equivalent to 80 miles per hour. Should expected wind speed surpass 30 m/s (70 mph), it is recommended that you turn off the tracker and use the provided extension rod to tilt the panels horizontally. This will reduce wear and protect the installation until the storm has passed, as this is the optimum position for the installation to resist high wind loads. If wind speeds are expected to go above 35 m/s (80 mph) it's recommended to remove the panels and move them to safety. This is fairly straightforward and the panels can be put back when the hurricane has passed. Do not attempt to remove the panels if it's already windy outside. PV-6 units in the field have withstood wind speeds up to 40 m/s, but we do not recommend building installations where such wind speeds are common. A wind sensor is being developed as an optional add-on. This will provide wind speed and direction data to a Heliomotion, allowing the unit to automatically turn away from the wind in stormy weather to reduce wear.

How is the tilt of the panels adjusted?

Heliomotion uses a fixed rod that follows the azimuth rotation and by pulling or pushing, automatically tilts the panels over the course of the day between 20 and 60 degrees, giving a sinus approximation of the sun's height angle. In morning/evening position the tilt starts at 20 degrees from the vertical plane. In south position the tilt is dependent on the latitude where the unit is installed. For instance, in London (latitude 50°) the tilt in the south position is 40° average to get the best angle towards the sun over the course of the whole year.

How does temperature affect solar panels?

Panels are rated at 25 degrees Celsius. Every degree above that reduces rated output by 0.5% and every degree below increases output by 0.5%. This refers to panel temperature which is hotter than ambient temperature.

How long is the design life and warranty of the product?

The Heliomotion tracker is designed to last for as long as the panels last, typically 25-30 years. We give a 5 year warranty to provide free replacement parts. Heliomotion steel parts including the column and solar tracker are powder coated for protection and durability. Panel manufacturers normally give a 25 year guarantee with a 95% output guarantee for the first 5 years and 87 - 92% for up to 25 years thereafter. (See final page of assembly manual for full details.)

Where do I find the test details for Heliomotion?

Go to the Documents page on the Bee Solar Technology website and various test report links are located after all the manuals and data sheets. We have applied to be MCS approved - we are likely to become the standard as there is no one else producing solar tracking systems in the UK. However, this is going to take some time to achieve as there is a large backlog of new solar panels and mouldings in the queue ahead of us.

How much noise does a Heliomotion system make?

The solar tracker itself is virtually silent. Listening very carefully right next to the tracker, it makes the sound of a distant cicada every 7 minutes or so when it updates its position.

When does the system return to its starting position?

When the sun goes 6 degrees below the horizon and it gets dark, the system rotates quietly back the way it came, in two stages, to its starting position ready for the next morning. The time therefore varies each day of the year.

What paint colour is used?

Heliomotion parts, including the column and solar tracker, can be ordered with a coating of either Anthracite Grey or Fern Green as the final layer of powder coating. (If there is a need to apply a second coating of corrosion resistant paint we suggest using spray paint with a matching RAL colour.)

Should I choose a grid-tied or a battery-tied system?

Our recommendation is to use the grid-tied system if utility power is available, and to use the battery-tied system for off-grid installations without access to utility power. The main reason for this is that the grid-tied system is simpler to install and allows you to automatically utilise 100% of your produced electricity. Furthermore, the grid tied system is likely to be cheaper.

How much battery capacity should I have for an off-grid system?

For off-grid properties, a 5 - 10 kWh battery bank is recommended - but it all depends on surplus generated and how much power is required when there is no light to generate power. This can allow you to store one full day's solar energy production for use during nights and cloudy days. Additional battery capacity allows for a greater buffer during cloudy/rainy days. EV charging will require more battery capacity.

What battery types are there?

There are several lithium ion battery systems on the market in 2023 (including repurposed EV batteries), PowerQuad/Powerwall/PowerVault/Libbi/PureDrive/GivEnergy etc, and they have replaced the older technologies including deep cycle gel batteries for solar battery systems. They are maintenance free, can be used indoors, have a long design life, and are made to withstand deep discharge cycles.

If my batteries are full, and my panels are working well, what happens to the surplus electricity being generated?

It will be discarded/returned to the grid.

How much space does a system take up?

The recommended turning circle for a single PV-3 is 3 metres, the PV-4 is 4 metres. Depending on the time of year, and the adjustment of the tilt, it will rotate up to 180 degrees and the lower edge of the panels will be between 500 mm and a metre off the ground, so you are looking at around a total height of about four metres. The recommended turning circle required for a single PV-6 is 5 metres. Average 380 - 400 watt panels each measure up to 1750 mm high x 1050 mms wide. Newer higher wattage panels used commercially in static installations are larger. The dimensions of the six panels together are approximately 3500 mm high x 3150 mms wide. You will find downloadable dimensions drawings for all system sizes on our Documents page.

The area around the foundation column needs to be clear so that the solar tracker can rotate freely without any obstacles. The minimum clearance from the column when using 1750 x 1050 panels is 1.3 meters for PV-3, 1.5 meters for PV-4, and 2 meters for a PV-6. It is strongly recommended to have at least 0.5 meters of extra clearance on all sides to allow for the panels to be tilted horizontally. See the PDF files describing the specific Heliomotion dimensions on the website Documents page for more info.

How do you mount a Heliomotion system?

There are three options: ground anchors, a large hole filled with concrete, or attaching it to bedrock. Because the system is securely bolted to the ground using the foundation plate, it means it can be un-bolted and moved if required to a new property. (See the installation manual.) The concrete plinth (one metre cubed for PV-6) will need between 4 and 7 days to harden before attaching the foundation column to the base plate.

When using ground anchors/screws, the person installing will require a specialised tool to drive the anchors into the ground. The anchors are more eco-friendly than using concrete and are quicker to install since there is no need to wait for the concrete to cure

Can I purchase the inverter from you? And panels, batteries etc?

When you buy a Heliomotion system you have the choice to buy just the unit itself (foundation piece, column, tracker unit, framework and fixings) or to buy the complete package including inverter, cables, panels etc. For our export sales, we expect that most resellers/customers will buy the panels and inverters locally and just buy the tracker with framework from us. You can install a Heliomotion at quite a long distance from the inverter; using the relevant cable, you will have only minimal losses up to 100 meters distance. At longer distances, we recommend a greater increase in the cable diameter. See next paragraph for more detail.

Should I use a string inverter or microinverters?

Heliomotion can be connected to the grid using either multiple micro inverters or a single string inverter. When using microinverters two panels connect to each micro inverter located directly underneath the panels, and an AC cable runs from the micro inverters to the nearest AC fuse box. When using a string inverter all solar panels are typically joined together in series and a DC cable runs from the panels to the string inverter, which in turn is connected to the nearest AC fuse box. The string inverter is often placed indoors. Use of micro inverters with Heliomotion are recommended for the following reasons:

- 1. Simpler installation** – The 24V AC-DC transformer that powers the solar tracker can be placed at the installation site as there is AC available at the site. In contrast, with an indoor string inverter the transformer is typically placed indoors and 2 extra wires are needed in the DC cable that runs to the installation site for carrying the 24VDC. Also, there is no need to install DC breakers when using microinverters.
- 2. Easier placement** – No need to find space indoors for mounting the large string inverter. Each microinverter can be mounted directly to the framework behind the solar panels.
- 3. Flexibility** – Each microinverter can be connected to the electrical phase where the power is most needed, giving the option of 1-phase, 2-phase or 3-phase systems. In contrast string inverters are either 1-phase or 3-phase with the solar power always divided equally across all 3-phases. Microinverters also allow for 3-phase power output with only 3 panels, whereas string inverters typically requires at least 6 panels to reach the minimum voltage needed to power a 3-phase string inverter.
- 4. Modular** – It is easier to expand the installation when using microinverters.
- 5. Inverter redundancy** – If a microinverter breaks only the panels connected to that inverter stop generating power, whereas if the string inverter breaks production goes down to zero.

6. **Panel redundancy** – If one of the panels is damaged, only output of that panel is reduced, whereas with string inverters it will negatively impact the output of all the panels on the system.
7. **Shading** – Microinverters optimise each panel individually, in contrast to string inverters where a single shaded panel in the string will have a large impact on power output.
8. **Smaller** – Microinverters are compact and do not weight a lot compared to string inverters, making them easier to install and transport.

Microinverters are not ideal in the following case:

1. When using solar panels with output ratings greater than the micro inverter's rating.
2. When using half-cell solar panels, as their DC cables are typically not long enough to connect to the micro inverter without use of extension cables.

If production data logging is required then string inverters sometimes include this functionality as standard, via a WiFi module, whereas microinverters typically require a separate energy meter (such as Enphase Envoy Gateway) to log production data.

How far away can a Heliomotion solar tracking system be placed from your property?

We recommend the system is placed within 100 meters of where the power will be used. The cable size can be adjusted to keep transmission losses low between the power plant and the inverter/charger. Transmission losses are proportional to the amperage so to keep losses low the voltage is kept high. The PV-4/6 systems run at 220 VDC and up to 6 amperes. Using for example 4mm² wires, the losses will be at most 2% at 40 meters, or 4% at 80 meters. Doubling the cross-sectional area of the wire will halve the losses.

What exactly is a kilowatt hour?

A kWh is a measure of how much energy you're using. It doesn't mean the number of kilowatts you're using per hour. It is simply a unit of measurement that equals the amount of energy you would use if you kept a 1,000 watt appliance running for an hour:- if you switched on a 100 watt light bulb, it would take 10 hours to rack up 1 kWh of energy. Or a 2,000 watt appliance would use 1 kWh in just half an hour. While a 50 watt item could stay on for 20 hours before it used 1 kWh. What else takes around 1 kilowatt hour?

It's hard to be precise, because the similar appliances can have very different wattages, but here are some rough examples of 1 kWh:

- Using a 10,000 watt electric shower for six minutes
- Keeping an immersion heater (3,000 watts) on for 20 minutes
- Cooking in a 2,000 watt oven for half an hour
- An hour's ironing with a 1,000 watt iron or 45 minutes with a 1,500 watt iron
- Less than an hour using a dishwasher (1,000 - 1,500 watts)
- Around three hours watching a plasma TV (280 - 450 watts)
- Keeping a fridge-freezer (200 - 400 watts) on for about three hours
- Keeping an electric blanket (130 - 200 watts) on all night
- Using a laptop (20 - 50 watts) all day
- Keeping a broadband router (7 - 10 watts) on for five days

What's the difference between kWh and kW?

kW stands for kilowatt. A kilowatt is simply 1,000 watts, which is a measure of power. So, for example, the 10,000 watt electric shower in the top bullet point above could also be called a 10 kilowatt shower. A kilowatt hour (kWh) is a measure of energy. A 1,000 watt drill needs 1,000 watts (1 kW) of power to make it work, and uses 1 kWh of energy in an hour. That's why, if you leave a TV or computer on standby, it is still using power and creating a kWh cost on your energy bill.

How many kilowatt hours should I be using each year?

That depends on the size of your home, the number of people in your family, and whether you spend a lot of time out at work, or most of your time at home, and whether you wish to charge an electric car. According to energy industry figures:

- If you live alone in a small home and are out at work full time, you might use 2,000 kWh of electricity a year and 9,000 kWh of gas
- A small family who live in a three-bedroom house and are in full-time work and education might use 3,200 kWh per year of electricity and 13,500 kWh of gas

- Four or five students sitting around all day in a large four bedroom house could rack up about 4,900 kWh per year of electricity and 19,000 kWh of gas.

What is the maximum panel size that can be used with a Heliomotion system?

For a standard PV-6 frame, the maximum recommended length is 1750mm and maximum width is 1050mm. A PV-4 can be fitted with 1750mm length x 1150 width. Many new panels are being launched with different cell options and different wattages. It is worth checking with us if you are not sure whether your chosen panels will fit.

What happens in a power cut?

This depends on whether you have a grid-tied or battery-tied inverter. A grid-tied solar inverter feeds power to the grid and so during a blackout the production is halted until power is restored. A battery-tied solar inverter works independently of the grid and so it will continue to supply power to connected loads even during a blackout.

How do I obtain support if anything goes wrong with my tracker?

There is a very detailed support section available from heliomotion.com/support and we are nearly always available to give advice by phone, 03333 034366 or email, sales@beesolartech.co.uk.