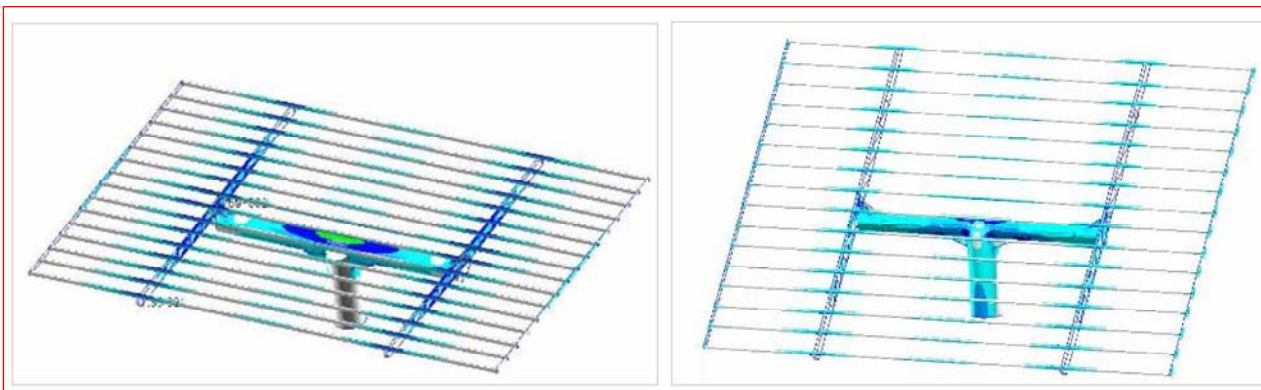


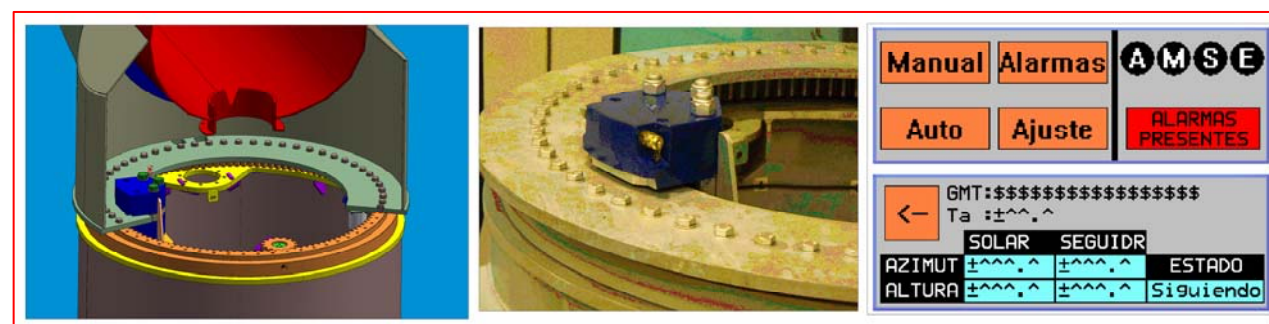
CLAVIJO GROUP SOLAR TRACKERS

- Designed and analysed by finite elements analysis considering the structure dead weight and the wind action.
- High performance: up to 35% more production on the photovoltaic modules compared to a fixed installation.
- Innovative patented azimuth brake.



INNOVATIVE AND DIFFERENT FEATURES

- Sturdiness
- Flexibility to install the photovoltaic modules
- Bronze bearings on the joints
- High precision of the tracking system (up to 0.5 degrees)
- Control program with an alarm management and event log (make the maintenance and overhaul easier)



HYDRAULIC BRAKE IN THE AZIMUTH MOVEMENT, PATENTED BY CLAVIJO GROUP

Protects the gear assembly between the planetary reduction gear box and the orientation crown, thus preventing critical points from breaking, such as the pinion teeth or the anchor flange on the reduction gear box. It is activated and deactivated with every azimuth movement, avoiding vibrations caused by the effect of the wind on the grid and in the gaps between the teeth of the crown gear and the reduction gear box pinion.

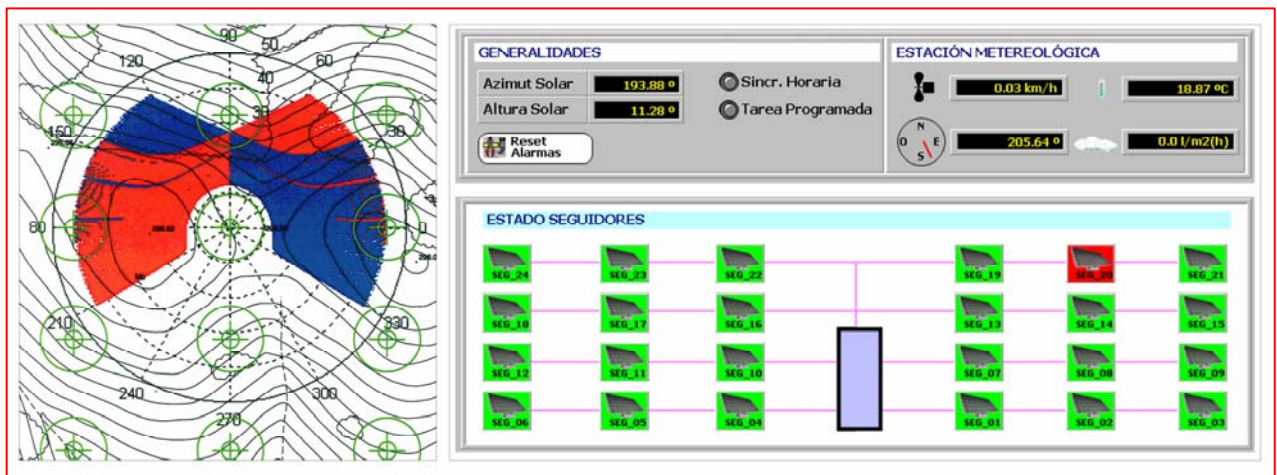
By using it, it reduces the dynamic loads which highly increase the stress of the wind on the grid. It also stabilises and secures the assembly when there are strong gusts of wind – the grid moves more softly and it is more controlled (sail effect). Together with the electric brake on the gear motor, it guarantees the stability and durability of the assembly.

CONFIGURATION OF THE TRACKERS

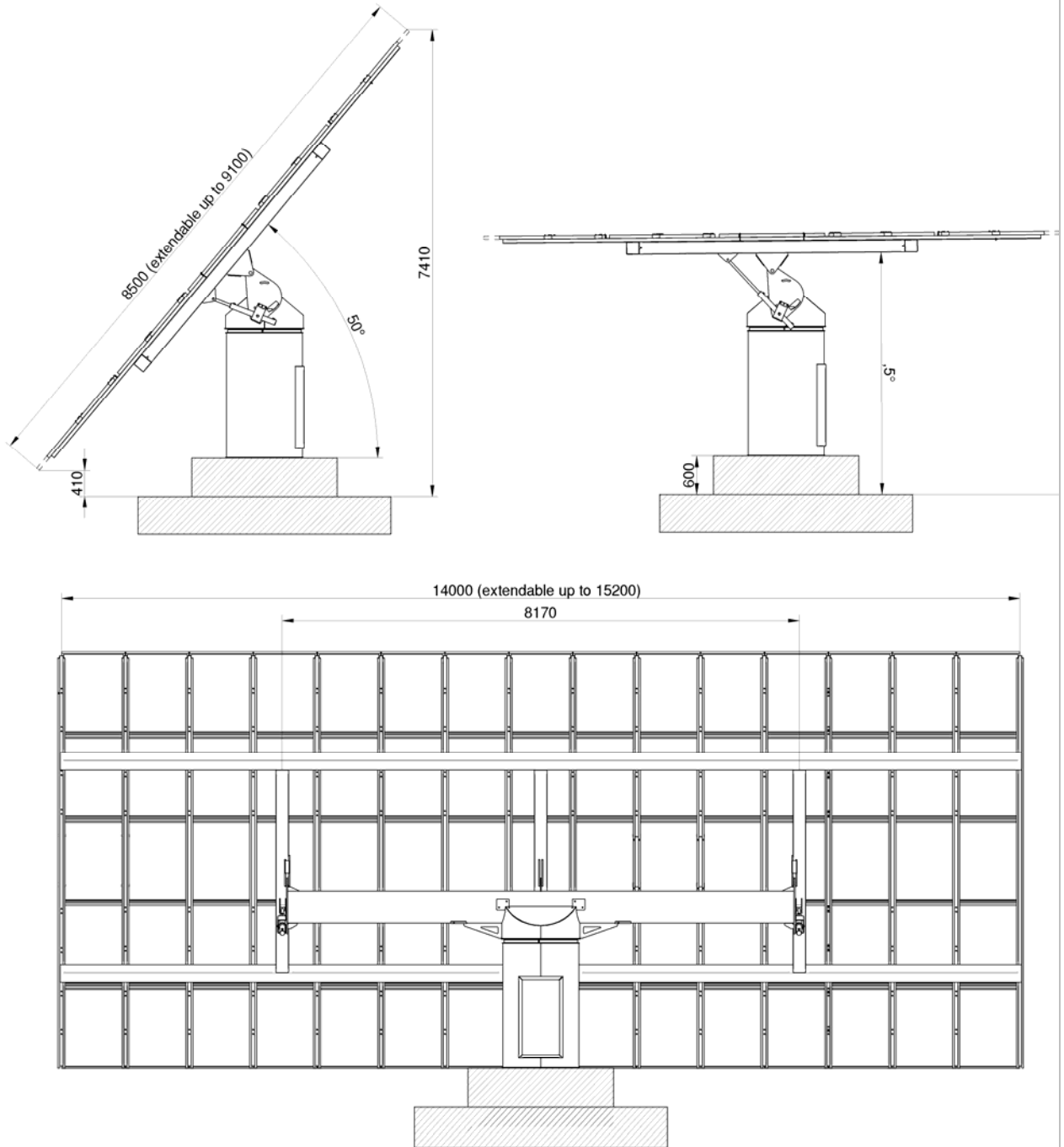
They can be modified globally if the site or installation is monitored or if they can be handled individually by the buttons in the electrical panel (emergency push button, reset button and switch to safety position for maintenance jobs), or by a portable terminal that enables the configuration of the tracker automatically or manually. It also enables other options such as visualisation and reset of alarms, or changing the configuration parameters (time, tracker location, rest criterion, minimum tracker operating angle, maximum azimuth and vertical turning angle...).

ADDITIONAL SERVICES

- Study of shadows
- Installation of trackers on site
- Studies of level curves on topographic drawings
- Assembly of anemometers and data registers, communication and monitoring of the site
- Start-up
- Preventive maintenance
- Use of anemometers, digital displays to view the speed of the wind, weather vanes or data registers to store information (up to 3 different ways at the same time: internal memory, USB pen drive or via FTP).
- Possibility of protecting the trackers from power failures by using hydraulic accumulators that enable the grids to rise automatically.



TECHNICAL CHARACTERISTICS



Tracker axes		2 axes: Azimuth and vertical	
Grid configuration		5 lines x 14 metres	Extendable up to 5 lines x 15,2 metres
Module surface		120 m ²	Maximum surface = 138,3 m ²
Module distribution	Type	Single-crystal module SOLARWATT model M230-96 with nominal power of 250 Wp. External measurements module = 1,604 x 1,054 x 50 mm	
	Amount / Power	5 lines x 13 modules	65 modules x 250 Wp = 16,25 Kwp
	Amount / max. power	5 lines x 14 modules	70 modules x 250 Wp = 17,5 Kwp

The final power and amount of the installed modules is by way of guidance, because it will depend on the needs of the investor and the module model that is chosen.

Structure material		Hot-dip galvanized steel (in accordance with standard ISO 1461)
Azimuth	Turn range	270 degrees (from -135 degrees to +135 degrees)
	Action type	Planetary reduction gear box and orientation crown with reinforced teeth
	Gear motor characteristics	Motor 0.33 Kw / 1,500 rpm / output speed = 0.93 rpm / reinforced pinion gear assembly (surface hardened)
	Electric brake	Controlled braking torque
	Hydraulic brake	Braking strength 175 kN
	Movement control	Absolute potentiometer, precision ± 0.1 degrees
	Safety 1	Control and tracking movement by automatic machine
Safety 2	Physical stop with 2 limit switches with a wheel.	
Vertical	Turn range	From 0 degrees to 50 degrees
	Action type	Central + 2 hydraulic cylinders
	Central characteristics	Motor 0.75 Kw / 1,500 rpm
	Movement control	Absolute inclinometer, precision ± 0.1 degrees
	Safety 1	Anemometer signal – Safety position (horizontal)
Safety 2	Physical stop with the cylinders, control and tracking movement by automatic machine and non-reverse installation on each cylinder	
Electrical panel	Power supply	230 Vac – 50 Hz, single-phase or 380 Vac – 50 Hz three-phase
	Electrical characteristics	Metallic, IP55, all the elements connected by external connectors. Includes OMRON PLC, speed variator for the azimuth movement control, automatic protection circuit-breakers, differential protection with 300 mA sensitivity and protection against high voltage (only advanced model).
	Tracking	Tracking program by astronomic calculation on the PLC. Protection against wind and snow. Shadow management (only advanced model).
	Operation and maintenance	Includes anti-fraud emergency push button, two-function push button for reset and maintenance position, alarm management for both current ones and past ones.
	Connectivity (optional)	<ul style="list-style-type: none"> <input type="checkbox"/> Touch-terminal for manual configuration and movement. <input type="checkbox"/> Serial port for configuration terminal accessible by external industrial connector <input type="checkbox"/> RS422 port (included in advanced model) <input type="checkbox"/> Optional Ethernet port <input type="checkbox"/> Access by GSM/GPRS modem and SMS service
Wind speed	Up to 40 km/h in working mode. Up to 120 km/h in sleep and safety mode.	
Anemometer (OPTIONAL)	Polyamide anemometer + digital display for wind speed + tracker signal output relay	
	Polyamide weather vane to control the direction of the wind	
	Data register up to 3 types at the same time: internal memory, USB pen drives and remote FTP (local or via internet). Real-time viewing on touchscreen of the signal from several anemometers.	
Vertical movement safety (OPTIONAL)	Possibility of raising the grid (safety position) by hydraulic accumulators if there is a power failure.	
Azimuth movement safety	Patented hydraulic brake system + braking disk that eliminates dynamic overloads caused by the effect of the wind on the grid. Independent brake shoes and easy to replace.	
Electrical consumption	0,5kw a day	
Approx. module structure without modules	5.800 kg	
Approx. module weight	2.100 kg	
Foundation	Subjected to specifications and remarks shown at the corresponding	

	foundation drawing			
Warranty	10 years for the metal structure			
Distance between trackers	N - S	27 metres	E - W	33 metres
The distances are by way of guidance, because they depend on the final dimensions of the grid and the location of the installation (longitude, latitude and altitude).				