



MAXIMUM ENERGY

**ades**  
SOLAR TRACKER

## ABOUT ADES

ADES is a pioneering Spanish research and development engineering firm, created in 1992, that develops proprietary renewable energy technologies that contribute to the sustainable development of the planet.

ADES has developed a **range of unique, adaptable and robust solar trackers**. Installing over 150 MW and 5000+ trackers since 2004, ADES has achieved a strong position as **international market leaders** on the cutting edge of tracking technology. ADES prides itself on superior customer service and best-of-sector product warranties.

With a consistent commitment to developing breakthrough technologies and applying ongoing technological improvements to existing products and services, ADES delivers solar park expertise and outstanding customer service to a wide range of satisfied clients in diverse markets.



## ABOUT SOLAR TRACKERS

Solar tracking is a widely-applied proven technology that increases solar park production by directing photovoltaic or concentrated photovoltaic to follow the sun along its path from dawn until dusk, capturing the maximum solar radiation for the longest time possible.

### ADES TRACKERS: UNIQUE DESIGN FEATURES FOR INCREASED PRODUCTION

ADES has conducted extensive in-depth research into photovoltaic components and pre-calculated meteorological factors to determine unique design features of ADES trackers that offer important increases in production compared to fixed installation panels and other trackers.

### EFFECT OF THE TRACKER ON THE EFFICIENCY OF THE INVERTER

Solar trackers make a positive impact on the total gain of the whole system, causing the inverter to work as much time as possible at a better level of performance.

For CPV trackers, please contact us.



## SOME OF OURS CUSTOMERS

ABANTIA  
ARIES INGENIERÍA Y SISTEMAS  
BP SOLAR  
CYMI - DRAGADOS GROUP  
ENDESA INGENIERÍA  
GES SIEMSA - GAMESA GROUP  
IDOM INGENIERÍA  
ISOFOTON  
ISOLUX CORSÁN  
MARTIFER SOLAR

## WARRANTY

ADES proposes a 10 year structural guarantee, and an initial mechanical 2-year guarantee, which may be extended to 5 or 10 years by prior contractual agreement for preventive and corrective maintenance performed by qualified ADES technicians. Please contact ADES to discuss other after-sales options.



TÜV Rheinland®  
**CERT**  
ISO 9001

## PRODUCTION GAINS: FIXED PANEL vs ADES TRACKERS

LOCATION	Annual Production Fixed Panel Optimal Angle [kWh/kWp]	Annual Production using ADES Tracker [kWh/kWp]	Gain	LOCATION	Annual Production Fixed Panel Optimal Angle [kWh/kWp]	Annual Production using ADES Tracker [kWh/kWp]	Gain
San Diego CA	1649	2224	34,9 %	Washington DC	1248	1686	35,1 %
Las Vegas NV	1702	2341	37,6 %	New York NY	1174	1612	37,3 %
Portland OR	1350	1903	41,0 %	Chicago IL	1297	1797	38,5 %
Seattle WA	1276	1776	39,2 %	Cheyenne WY	1532	2123	38,6 %
Denver CO	1564	2161	38,2 %	Helena MT	1359	1913	40,8 %
Albuquerque NM	1759	2419	37,5 %	Boston MA	1313	1817	38,4 %
Oklahoma City OK	1428	1957	37,1 %				
Memphis TN	1324	1791	35,3 %	Toronto ON (Canada)	1176	1615	37,3 %
Miami FL	1535	2097	36,6 %	Ottawa ON (Canada)	1260	1713	36,0 %
Charlotte NC	1347	1797	33,4 %	Calgary AL (Canada)	1326	1858	40,1 %



## PRODUCTS UNDER PATENTS

ES - 2004 02167

ES - 2007 02392

US - 11/214. 400

MX - PA 2005-009345

# ADES DUAL AXIS SOLAR TRACKERS

At ADES, our aim is to ensure greater freedom and flexibility in the design of your solar project, and increasing output with the greatest speed and technological simplicity possible.

## A RANGE OF COMPETITIVE ADVANTAGES:

### DESIGN STRUCTURAL ADVANTAGES

- Low height and minimum visual impact tracker.
- Arms that integrate the electric panel board, traction clamps, hydraulic control system and battery.
- Option to integrate the inverter into the tracker by adding an extension.
- Centre of oscillation [bolt] slightly above the centre of gravity, endowing the tracker with greater stability.
- Increased reliability and robustness of the control system compared to other smaller-sized solutions.
- Arrangement of module rows at different levels and on two slopes:
  - Improved ventilation for the modules, which increases their efficiency and useful life.
  - Perfect stability of the assembly and improved coefficient of wind resistance for the machine, due to the 'steps' design of panel structure.

### OTHER ADVANTAGES

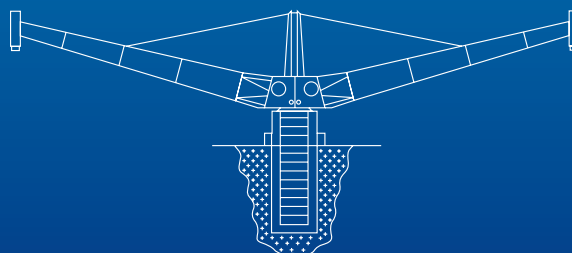
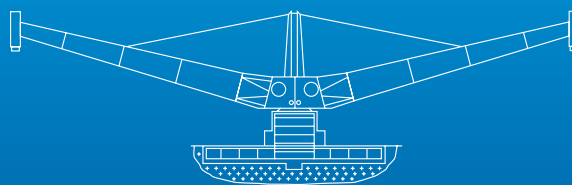
- Astronomical tracking system for increased focus precision and higher control.
- Minimum power consumption per machine (only one hydraulic actuator for both tracker movements).
- PLUG & PLAY machine ensures the independence of tracking movement, freeing the tracker from grid tension variations and storing two days of autonomy in a battery inside of the tracker.
- Traction system through hydraulic technology.
- Monitoring of tracking movement.
- Density energy: 1MW / 7,4 acres [ 3,6 ha ] assuming flat land and 230w modules.
- Guaranteed stability even in conditions in which the protection systems fails due to gusts of wind of over 65 mph (30 m/s), as demonstrated by tension and fatigue resistance studies carried out on each component.
- Important quality control at both internal and external levels.
- Possibility of adapting any module (standard design for panels maximum length up to 1700 mm). For other lengths please contact ADES.

## BIGGER IS BETTER

Compared to solar park designs utilizing smaller trackers, using ADES solar trackers for your project allows:

- Reduction of the number of trackers for the same level of power.
- Rapid assembly and start-up by reducing the number of machines to install.
- Minimization of the space occupied by shadow, with the elliptic tracker form.
- Significant savings on infrastructure costs [foundations, wiring, land, fencing, service roads, ditches, etc.].
- Reduction in voltage drops due to minimized number of trackers and distances between trackers.
- Important reduction of the whole life maintenance cost of your solar park.

## FOUNDATIONS



## INNOVATION: ADES TRACTION CLAMP TECHNOLOGY

Solar trackers perform step-by-step movements and spend more time closed down than actually in action, making it necessary to use a negative brake.

For this reason, the R+D department has developed and patented a new traction system, known as a traction clamp, which eliminates the traditional crown and pinion gear systems.

This system reduces the maintenance requirements of the tracker by eliminating the motor reducers and using the pure tangential force maximizing the tracker's energetic performance.

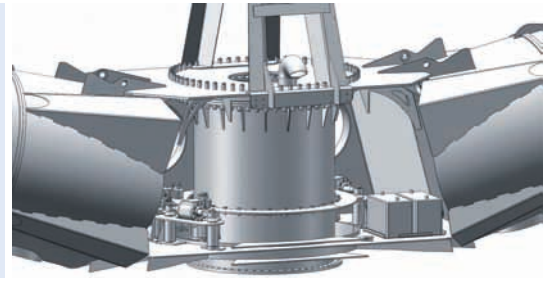
Thus, instead of braking, the tractor clamp increases the reliability of the system by sliding, thereby guaranteeing that the system will be more profitable.



## NEW: AUTONOMOUS TRACKERS VS GRID FAILURES

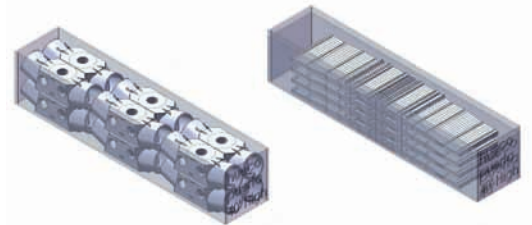
Thanks to our experience in the field, we have detected the need to isolate solar trackers from the grid. This solution guarantees the protection from disturbances of the electrical grid [voltage drops, peaks, etc.] that destabilize the trackers.

The system is designed to have two days autonomy, providing higher security of the installation to keep the trackers on alert even in case of the network failure.



## PRODUCTION AND TRANSPORT: HIGHLY OPTIMIZED

Thanks to experience and sophisticated design, ADES trackers can easily be transported in a highly efficient process. ADES know-how has designed trackers with the highest ratio of MW transported per truck or container. For example, 10MW of trackers (371 machines) can be shipped in 90 containers. The simplicity of the different spare parts of the trackers enables ADES to potentially utilize local manufacturers for welding, galvanisation processes, etc.



## EXTREME WEATHER CONDITIONS PACKAGE

Photovoltaic installations utilizing ADES trackers can be placed in extreme weather condition zones (frozen, snow belt or desert areas). ADES commits to adapting trackers as feasible to accommodate the project conditions. The trackers are designed to close and protect the mechanical and hydraulic elements that are in the heart (column) of the machines. Depending on the location, ADES will provide the optimal oil that supports extreme conditions. Please contact us for more information.



## FOUNDATIONS: MADE-TO-MEASURE

The trackers foundations are an important factor in successful power plant implantation. A simple geological study of the land, confirming its compression (k factor), will optimise foundation design and costs. With geotechnical information, ADES will generate the best foundation design addressing the specific needs of the project site.



## COMMUNICATIONS AND MONITORING SYSTEMS: THE ADES SOLUTION

Utilizing the ADES system leads to better monitoring and real-time information on the state of production, greater yield on investment, and the capacity to identify and attend to potential systems failures as quickly as possible.

The control system includes a connector for serial port RS485 that is used for the integration of other systems, such as Inverters, Strings and Meters.

### COMPREHENSIVE SOLUTION

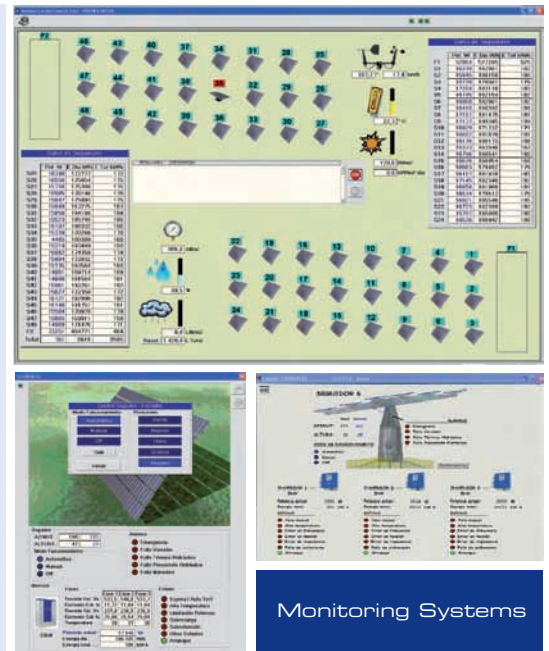
Our solution incorporates all the Solar Park monitoring systems in a single Monitoring Software Program, thereby maximizing the performance of each inverter and the use of the communications network.

### INFORMATION

The monitoring system has a configuration application that provides accumulated energy reports according to the information supplied by the system of inverters or meters connected to the communications network.

### REMOTE CONTROL

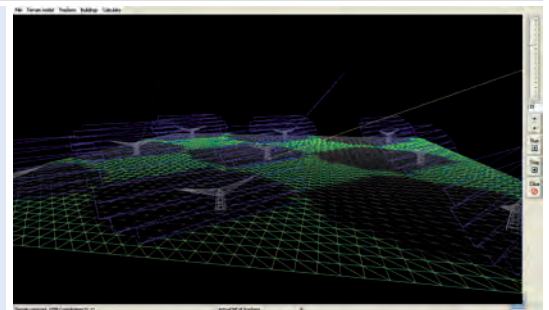
By means of a broadband Internet connection, it is possible to use remote control as if you were sitting in the installation control centre itself to direct tracker activity.



## SHADOW PROGRAM: ADES SOLAR PARK DESIGN

A complimentary park design shadowing and shading program, available online at [www.ades.tv](http://www.ades.tv), is available to assist in the design of solar parks utilizing ADES solar trackers.

SolarFarm is a design tool for solar parks that permits the analysis of shadows thrown by a certain distribution of solar trackers on topography terrain at any orientation, detecting any interference in the shadows thrown by a machine and machines nearby.



## WORKING WITH ADES: CUSTOMER SERVICE

ADES offers the maximum level of consultation available in the marketplace from a Solar Tracker manufacturer:

### SOLAR PLANT DESIGN

Customers enjoy the advice of ADES technical staff for the design of the plant [implantation of the trackers on the land].

### LOGISTICS AND SCHEDULES

A realistic and reliable planning schedule is determined between the customer and ADES in order to guarantee timely deliveries and installation.

### INSTALLATION

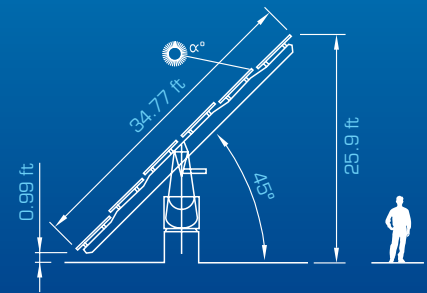
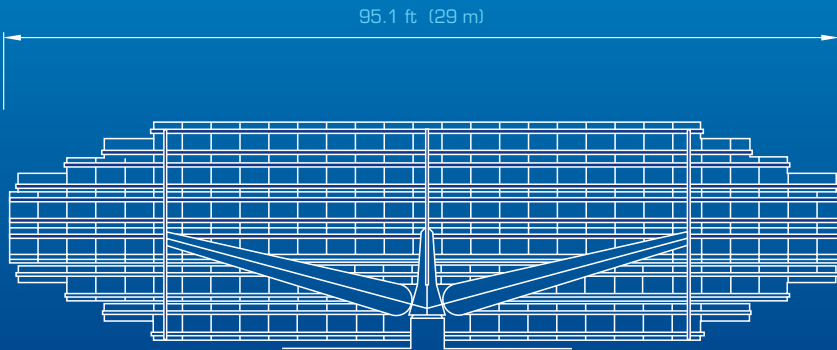
ADES will always provide a chief installation officer to train your workforce and guarantee the quality installation of your trackers.

### AFTER SALES

ADES maintenance programs are available for our customers. The maintenance can be conducted by our team (or authorized team) or by your own labor force trained by ADES experts.



**2798 FT<sup>2</sup> (260 M<sup>2</sup>) DOUBLE AXIS SOLAR TRACKER  
MODEL: 6F-29 M**



**PHYSICAL CHARACTERISTICS**

Configuration (rows - length)	6 rows - 95.1 ft (29 m)	
Area (varies according to the module)	Up to 2798 ft <sup>2</sup> (260 m <sup>2</sup> )	
Adjustable inclination angle	Up to 45°	
Azimuthal sweep	250°	
Type of tracking	Azimuthal	Automatic. Precision $\pm 3^\circ$
	Inclination second axis	Automatic. Hydraulic cylinders controlled by control room
Annual energy consumption	Approximately 160 Kwh/year	

**MECHANICAL CHARACTERISTICS**

Resistance to wind	Structure designed to resist up to 99.4 mph (160 km/h) in safety position
Weight of the structure without modules	7.33 t (6.650 kg)
Traction system	Hydraulic tractor clamp

**SYSTEM SAFETY DEVICES: OUR PRIMARY OBLIGATION**

Guaranteed sliding movement without structural damage under strong winds  
Reduction of the stresses on the machine under windy conditions

Gusts of wind	Solar project includes anemometers, supplied	
<p>13.1 ft</p>	In the horizontal position	Automatic positioning in safety position when wind speeds exceed 37.2 mph (60 km/h)
		Night protection position
		Theft difficulties
Under worst weather conditions (wind from back of machine), and failure of park security systems, the structure supports up to 67,1 mph (108 km/h) (norm NBE AE 88)		

ADES trackers bear the CE mark and fully comply with the following European directives: Machine construction directive 98/37 CE · Regulation 73/23 CE regarding Low Voltage · Electromagnetic Compatibility in accordance with 89/333 CEE · Wind loads in accordance to NBE-AE-88 · Metallic structure in accordance to Norm NBE-EA95



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[www.AdesSolarTracker.com](http://www.AdesSolarTracker.com)