



YOUR SPECIALIST FOR TRACKING SYSTEMS

**NOT ONLY SIMPLY BRILLIANT,
BUT BRILLIANTLY SIMPLE**



**INTELLIGENTLY CONTROLLED
SYSTEMS PROVIDE A CLEAR
ADVANTAGE BOTH ECONOMICALLY
AND AS A SECURE INVESTMENT**

A bright idea: Solar tracking systems by DEGERenergie

THOSE WHO STRIVE TO HARVEST MORE OF THE SUN'S ENERGY WILL HAVE TO MOVE AWAY FROM FIXED SYSTEMS

Tracking systems: Single- or dual-axis

Nature did it first: Numerous plants, like the sunflower for example, orient themselves towards the sun during the course of a day. It is a simple, but brilliant principle that can be applied perfectly to optimizing efficiency in solar energy systems. The reason: Photovoltaic modules that follow the sun's path capture a higher amount of energy and therefore produce decidedly more power than modules in a fixed installation.

Higher efficiency with intelligent tracking. Even though photovoltaic modules' efficiency factor has been improved considerably over the last few years, the physical ceiling has essentially been reached. A genuine leap in a systems' efficiency can only be achieved by intelligent tracking. Only then can more energy be generated no matter which modules are used.

This is best demonstrated with an example. The Spanish solar park operator Picanda Solar has been comparing the yields of its photovoltaic systems for years. The results showed that the fixed module installations yielded about 1,500 kWh/kWp – identical modules that tracked with DEGERtracker Typ 5000 NT achieved 2,200 kWh/kWp. That is a yield improvement of 46 percent.

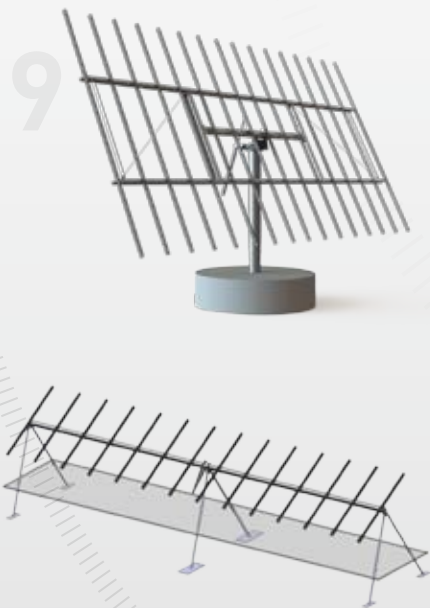
When compared to astronomically-guided dual-axis tracking systems, the DEGERtrackers enjoy a clear advantage. The Fraunhofer Institute study calculated an increase of around

37,6 percent for astronomically-guided systems over fixed systems in European latitudes. DEGERtracker's yield in conjunction with the Maximum Light Detection Technology (abbr.: MLD) shows an average global increase of up to 42,9 percent over fixed systems. Depending on the location, the yields can be even higher.

High in yield, economical in consumption. Their low-energy consumption is also a factor in the systems' high level of efficiency. For example, a dual-axis DEGERtracker D100 does not even use 0.4 percent of the additional energy it yields.

Flexibility meets longevity. DEGERenergie's solar tracking systems are flexible assembly systems and suited to all commercially available module and inverter types. The negligible maintenance costs and robust construction with high-quality materials ensure a long, maintenance-free service life.

Example of a dual-axis system:
DEGERtracker D100



Example of a single-axis system:
DEGER TOPtracker S60H

i

Dual-axis models – DEGERtracker NT- and D series: active tracking systems for open areas and installations with varying mast heights. Module surfaces 25 / 40 / 53 / 70 m², suitable for all commercially available solar modules.

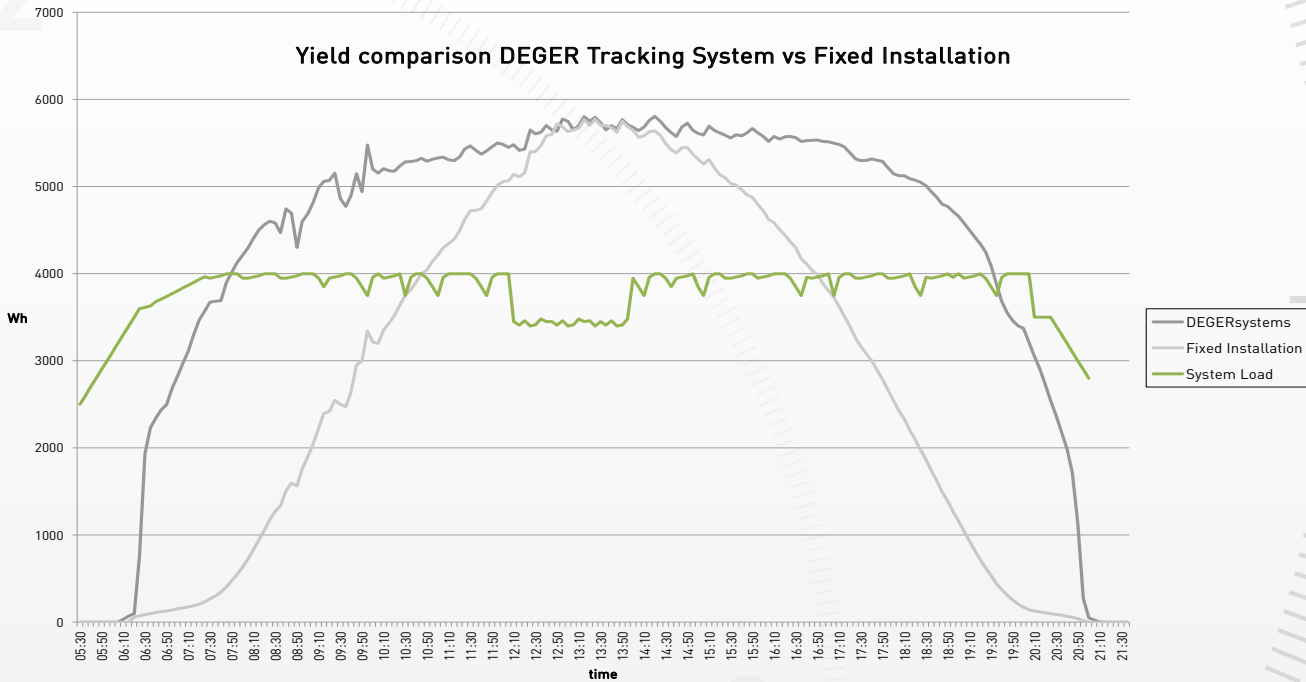
Single-axis models – DEGER TOPtracker®: active tracking systems for open areas and for integration in buildings. Module surfaces from 8.5 to 41,6 m², suitable for all commercially available solar modules.

DEGERtracker: Dual-axis systems for maximum efficiency. Precisely at the point where the most irradiation can be absorbed – that is where the dual-axis DEGERtrackers always align the photovoltaic modules and can thus achieve an up to 45 percent, partly higher, yield increase.

DEGER TOPtracker®: Record holder for efficiency in single-axis systems. Single-axis tracking is usually sufficient, depending on the location and application. Here, too, the additional 28,1 percent yield is an excellent achievement – the DEGER TOPtracker® holds the world record for single-axis systems.

Quick installation. Easy and fast assembly saves an enormous amount of installation time. The fact that DEGERenergie systems do not require programming or adjusting – as astronomically-based systems do – exponentially increases the time-saving advantage for putting the system into operation.

The steel and aluminum structure of a DEGERtracker is tested and approved by TÜV, UL/CSA certified and has passed tough static load tests in the wind tunnel, performed by the material research laboratory (MPA) Stuttgart.



The results are clear:

Over the course of a day, a DEGERtracker (dark gray line) covers the energy demand of a small business enterprise (green line), and even produces a large surplus. Owing to this surplus, it is possible to charge gently over a long time if a battery storage system is used or depending on the country, an additional feed-in tariff can be achieved.

i

The DEGERtrackers perfectly cover the daily energy demand. Compared to fixed installations, they have a balanced consumption profile and produce a large surplus.

Example of a
dual-axis system: DEGERtracker 5000NT



YOU CAN'T ALWAYS RELY ON THE WEATHER – BUT YOU CAN RELY ON AN INTELLIGENT CONTROL SYSTEM

Maximum Light Detection: most cost-effective module alignment

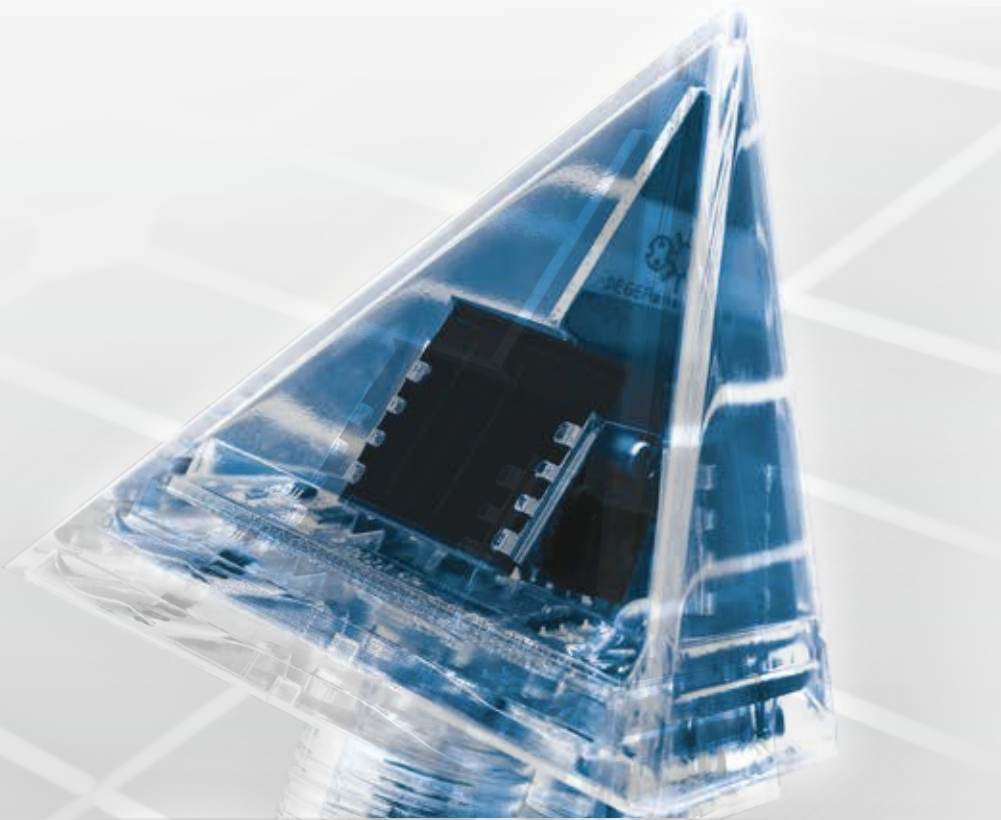
Technology that is proactive gets more out of the sun.
The light irradiation's intensity is influenced by a number of factors - primarily clouds, of course. That is why it is crucial that a smart control is able to react to the conditions accordingly. The MLD principle takes on that task.

Pinpoint precision alignment = maximum yield: the Maximum Light Detection principle (MLD). The MLD or Maximum Light Detection principle is based on the most accurate, fastest and most energy-saving tracking of the solar module toward the maximum energy point. That function is the responsibility of the patented control module, the MLD-Sensor. The control module continually measures intensity and angle of the incoming light and moves the solar module installation into the most advantageous position. The sensor not only takes the solar irradiation into account, but also, for example, light that is reflected off snow, water or light-colored rock, or diffuse solar irradiation that penetrates the clouds – and does so individually for each system.

What is important here: only those movements that will result in a direct yield increase are carried out. The convincing result:



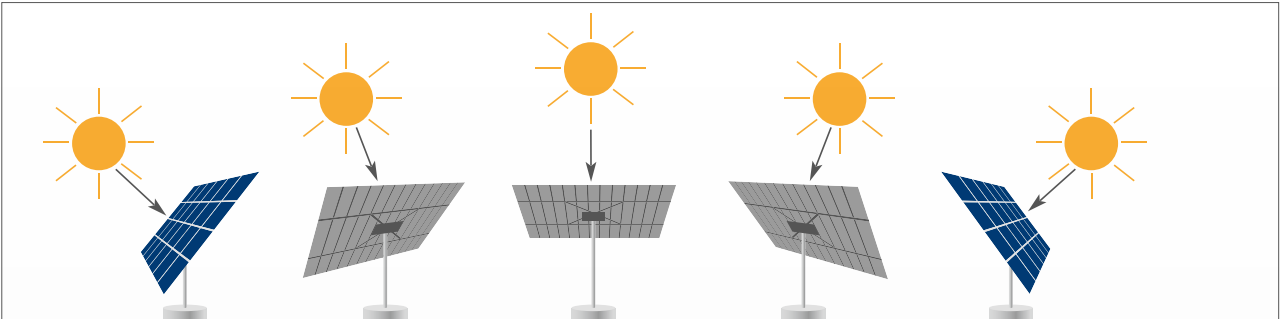
the MLD-Sensor not only achieves the maximum precision of +/- 1° respectively, but also reduces the cost of producing power by 20 to 30 percent less than rigid systems.



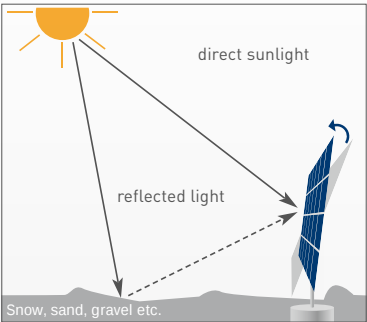
The MLD-Sensor – the critical component in the MLD principle of controlling tracking systems.



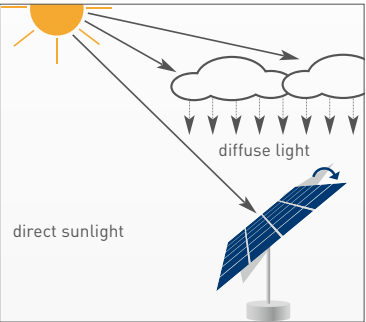
MLD -Technology Astronomical Control



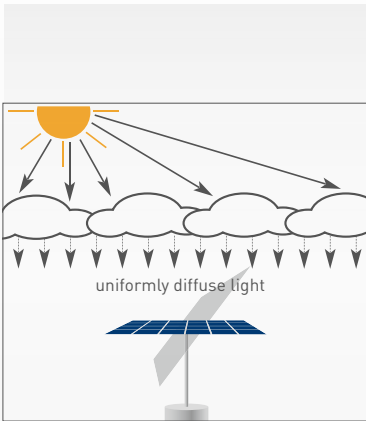
Sunshine: The DEGERtracker directly faces the sun all day.



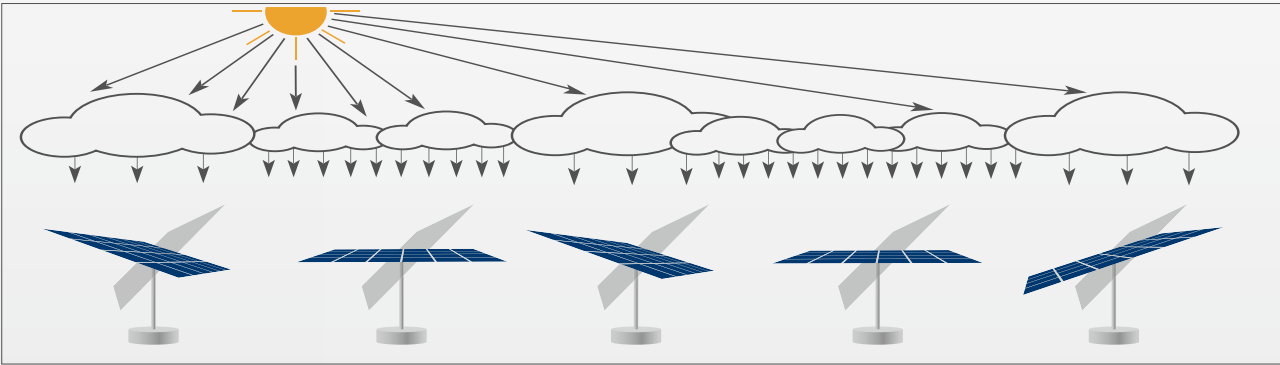
Reflecting surface: The DEGERtracker uses direct solar irradiation as well as energy from reflected light.



Partly cloudy: In addition to the direct solar irradiation, diffused light is also used to maximize the effect.



Overcast sky: The DEGERtracker catches all the diffused light by moving to horizontal position.



Varying light conditions: Because of different levels of cloudiness, the light conditions in solar parks vary for each DEGERtracker. The individual control makes sure every DEGERtracker is optimally oriented to the brightest source of irradiation. This guarantees the highest energy yield possible.

i

The solar tracking systems of DEGER are highly weather resistant and even under harsh weather conditions like snow and wind the MLD sensor is highly efficient and provides the maximum possible energy gain.



Example of a dual-axis system: DEGERtracker 3000NT

FIRST IT WAS THE INNOVATIVE
TECHNOLOGY THAT PERSUADED US.
THEN IT WAS THE YIELD INCREASE
THAT EXCITED US

DEGERtracker: A 46 percent increase was achieved with the MLD principle

at the Olmedilla de Alarcón Solarpark

Olmedilla de Alarcón, Spain
1,250 DEGERtracker 5000NT

TECHNOLOGY THAT CATCHES ON. WITH ENGINEERS, NEGOTIATORS AND CONTROLLERS

Reference projects: DEGERenergie worldwide

What do Ontario, Sicily and the Australian Outback have in common? They all host some of the many solar energy facilities across the globe that are equipped with intelligent tracking systems made by DEGERenergie. No wonder, because after all, DEGERenergie is specialized in tracking systems and has been producing them in series for over 15 years. Around 50,000 DEGERtracker (Status 04/2014) comprising ca. 2,600,000 m² of module surface space are connected to the grid worldwide. And the trend is rising. Regardless of where these systems are set up, whether in sun-soaked desert regions or in more temperate climates – the economic advantage is always ensured.

Energy awareness begins with the planning. DEGERtracker do not only demonstrate their benefits through emissions-free, resource-friendly power production. The energy amortization has also convinced environmentalists and related associations. After only about three years, as much energy is gained on average as was used for the total construction of the systems, including concrete buildings, steel constructs and wiring.

Longevity for top investment security. Solar energy systems cannot compete with the longevity of the sun as a source of energy. Yet they must still be cost-effective over the long term. That means: the systems must live up to a high quality standard down to the smallest detail and thus withstand the sometimes extreme conditions in the respective locations they have to operate in. Optional warranty extensions provide DEGERenergie's solar tracking systems with even more security – today, tomorrow and for years to come.



DEGER TOPtracker® 40NT, Greece



Former landfill site with 54 DEGER TOPtrackers®, Germany



DEGERtracker 5000NT near Alice Springs, Australia



Solar park with 21,000 m² of solar module surface, Spain



DEGERtracker 6000NT Wisconsin, USA



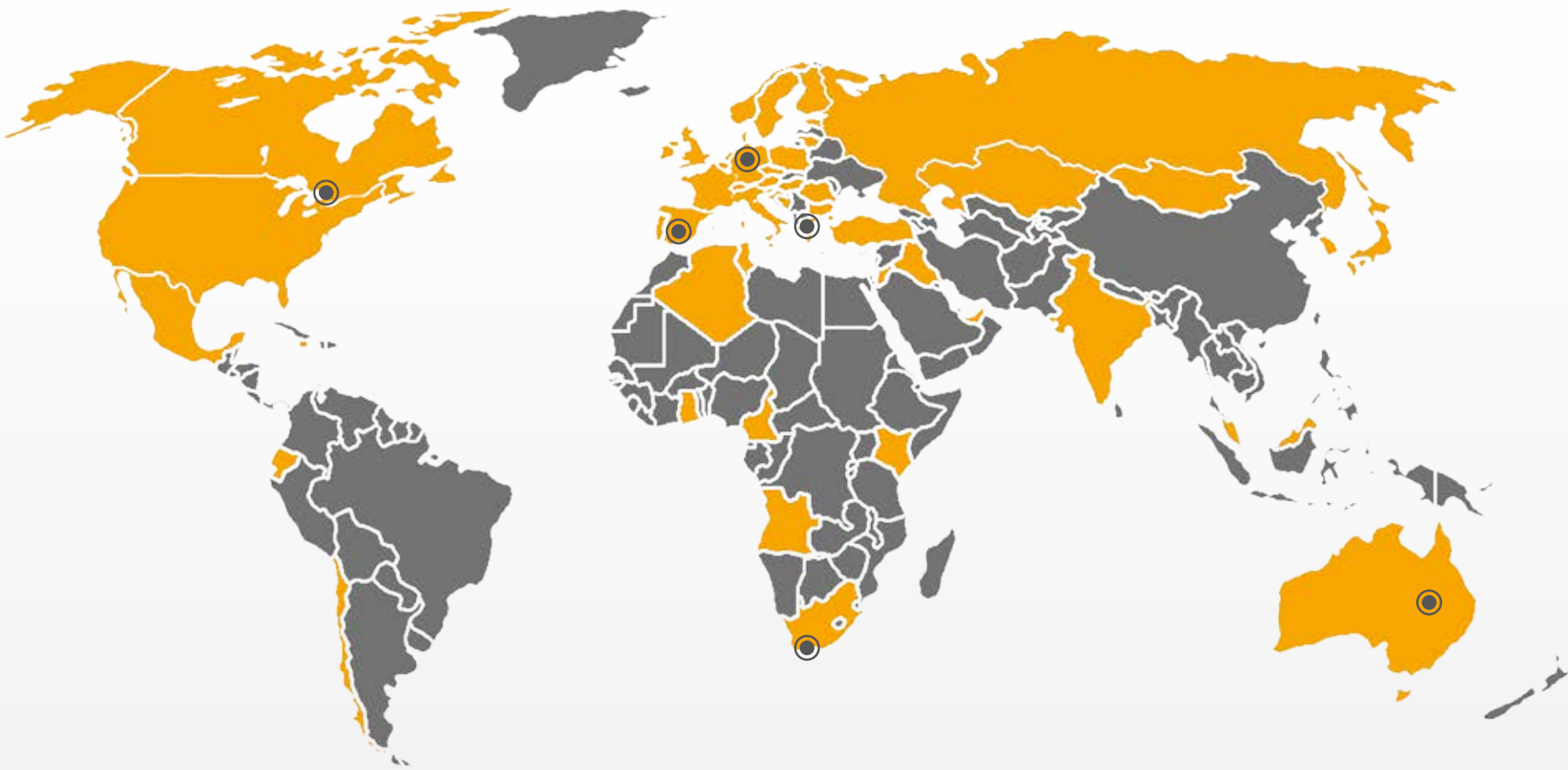
Roof system with 120 DEGER TOPtracker®, Spain



DEGERtracker 3000HD sewage treatment plant Birsfelden, Switzerland



DEGERtracker 9000NT racetrack Zolder, Belgium



● DEGERenergie sales and production locations

i

In many cases the substrates where large solar fields arise are not completely stable. In particular on former dumps, etc., the earth can shift somewhat or the foundations sink. That is no problem for the MLD Principle: inclines up to 5 degrees are compensated. That is an advantage for installation and flexibility that assures security in the future.



Example of a single-axis system: DEGER TOPtracker® 8.5

At work around the world:
Solar tracking systems by
DEGERenergie

- Algeria
- Angola
- Australia
- Austria
- Belgium
- Bulgaria
- Cameroon
- Canada
- Chile
- Croatia
- Cyprus
- Czech Republic
- Denmark
- Ecuador
- Estonia
- Finland
- France
- Germany
- Ghana
- Greece
- Hungary
- India
- Iraq
- Ireland
- Israel
- Italy
- Jamaica
- Japan
- Kazakhstan
- Kenya
- Korea
- Lithuania
- Luxembourg
- Malaysia
- Malta
- Mexico
- Mongolia
- The Netherlands
- Norway
- Poland
- Portugal
- Romania
- Russia
- Slovenia
- South Africa
- Spain
- Sweden
- Switzerland
- Tunisia
- Turkey
- United Arab Emirates
- United Kingdom
- USA

INVESTMENTS AND HIGHER YIELDS CAN BE RELIABLY CALCULATED WITH INTELLIGENTLY-GUIDED SYSTEMS

Lleida, Spain
180 DEGERtracker 5000NT

Security for investments, revenue and follow-up costs



WE ALSO GENERATE MOVEMENT TOWARDS PROFITABILITY WITH PHOTOVOLTAIC SYSTEMS BY PUTTING INTELLIGENT MOVEMENT INTO SOLAR MODULES

Convincing arguments: lower cost, higher yield, faster amortization



Reaching 100 percent optimum yield faster and for a longer period. While fixed systems have to "wait for the sun", the modules equipped with DEGER tracking systems are automated in such a way that they can capture the sun's optimum irradiation. That pays off: By virtue of a significantly higher yield, and enabling faster amortization as a result.

Whoever wants to be successful as an investor has to think in the long-term. That's why not only the direct investment figure alone counts when financing a solar energy system or solar park. A view to the future is of primary importance in this case: How do investments, operating and follow-up costs stack up against the yield? Solar energy systems equipped with intelligent DEGERenergie tracking systems show clear benefits as opposed to rigidly installed systems or those equipped with tracking systems based on astronomical data. Lower production costs per kWh power through higher yield – and accomplishing that over a long period of time.

There are no surprises awaiting you in terms of cost. High functional reliability and maintenance-free operation reduce the follow-up and operating costs for all systems equipped with DEGERtracker and makes them accurately calculable over the long-term.

Lower investment cost – the same yield results. Intelligently controlled solar energy tracking units pay off regardless of location, module performance level or price. The total amount invested to achieve a certain energy yield is always distinctly higher with fixed systems than with the DEGERtracker. No matter which DEGERtracker is used as the calculation basis - the more powerful the modules are, the more the tracking affects their yield in a positive way. In addition, DEGERtracker provides a considerably more balanced load profile and therefore a more constant feed and lower cost for inverters. That speeds up the "Return on Investment" and shortens the amortization period substantially.

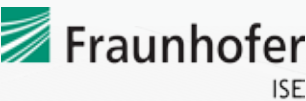
FRAUNHOFER ISE CERTIFIES 42.9% GAIN

Comparative measurements at the solarpark Rexingen

From March 2011 to February 2013 the solar experts at Fraunhofer Institute for Solar Energy Systems (ISE) compared four different photovoltaic systems at the DEGER solar park in Horb-Rexingen: fixed module surfaces, a single-axis tracked system with MLD technology from DEGER, a dual axis astronomically tracked system and a dual axis system operated with MLD tracking. All four systems were equipped with the same type and number of modules. Within the scope of quality monitoring Fraunhofer ISE determined their yield and power consumption in particular

Technology	Static 30° South facing	Single axis MLD	Dual axis astronomical	Dual axis
AC yield (kWh)	9191	11774	12647	MLD
Own consumption per year (kWh)		40	137	52
Additional yield compared to static system		28.1%	37.6%	42.9%

Availability of measured data for the year 2012: 100%



Conclusion of the Fraunhofer ISE

- DEGERtracker are generating a 42.9% higher yield as static systems.
- DEGERtracker are generating a 5.3% higher yield as astronomical controlled systems.
- DEGERtracker have the lowest own consumption compared to the measured tracking systems in this study.
- If we take the own consumption into account, the DEGERtracker will even have a 6% higher yield as the astronomical system.
- The generated additional yield due to the DEGER-MLD-Tracker is visible both during low level diffuse light conditions and high level diffuse light conditions.

Source: Fraunhofer ISE Report PMZ940-Adr-1201-V1.01

TRACKING SYSTEMS BY DEGERENERGIE. VERSATILE IN APPLICATION – EVEN IN COASTAL REGIONS

Kolovos, Greece
30 DEGERtracker 7000NT

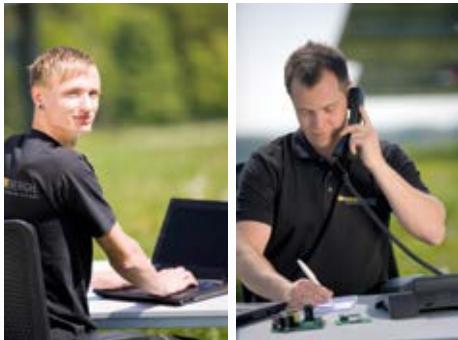
Solutions for planners, installation construction firms, operators, investors



COMPREHENSIVE DEGERENERGIE SUPPORT COMES IN A WELL-ROUNDED PACKAGE: CONSULTING, PLANNING, TRAINING AND SERVICE FROM ONE SOURCE

Knowledge transfer: The basis for investment security

Know-how is not a one-way street in our book. DEGERenergie has more than a decade of experience in solar technology and works continuously on developing it further. Thus our specialists' expertise is constantly supplemented by new knowledge and technologies. Our customers benefit from the results. And that occurs from the first moment onward. Regardless of whether installation company, investor or operator – we are happy to pass along our knowledge of intelligent controlling systems and advise individually on each project. In that connection we have – among other things – developed comprehensive planning tools and a detailed construction program – the perfect foundation for improved efficiency. Furthermore, DEGERenergie provides support in the initial planning phase in the form of model diagrams. Details of the respective configuration are developed on an individual basis.



DEGERenergie provides you with expert advice to match your specific needs from the initial planning phase to the completed project.

Efficiency has set a precedent. The technical opportunities of DEGERenergie tracking systems are only one part of the whole – utilizing them sustainably is the other. That is why we set such store by the operators' and installers' expertise and furnish extensive instruction and specialized training in results-oriented training program packages. The reason: solid expertise improves and secures the entire systems' efficiency in the long run. The training sessions are conducted at DEGERenergie's head office. The training sessions can also be conducted on the customer's premises on request. What is important for our international customers to know: you will be taken care of by selected and specially trained sales partners wherever you are in the world.



A clear design and comprehensive information: DEGERenergie's website with the option of subscribing to our newsletter.



... or our experts would be happy to visit you in person.



Those who know more improve the systems' efficiency.



That is why DEGERenergie offers instruction and specialized training.



The training sessions are conducted at DEGERenergie's headquarters.



Weather-resistant, safe and maintenance-free. These demands are already firmly in place at the top of the requirements list for all our products during the concept development phase. DEGERtrackers also have had to prove their worth in a wind tunnel, for example. Our own safety standards, which we apply in these cases, are above and beyond what either the law or insurance companies require. After all, DEGERtracker tracking systems are also put into service in regions with extreme climactic conditions, such as deserts or mountainous areas. Here, too, they must prove that they are a good investment over a long period of time and perform reliably for many years. DEGERenergie also places its trust in reliability and technology of convenience for the assembly process. Extremely short assembly times save time and money – the systems are ready to operate within a short time.

Our symbol for quality – optionally extendable guarantee. You can depend on DEGERenergie. For example, all DEGERtrackers are TÜV-inspected and have passed the very stringent endurance tests administered by the Materialprüfanstalt (MPA) [=Materials Testing Institute] Stuttgart and wind tunnel tests. Some models are certified according to the UL/CSA guidelines for North America. Moreover, there is also our boundless faith in the products.

And there is yet another worthwhile certificate – with a view to quality, but also to the environment. DEGERenergie is certified according to ISO 9001. Among other things, that means that all tracking systems are manufactured in compliance with environmentally friendly guidelines and can be 100 percent recycled as raw materials (aluminum and steel). When compared to fixed systems, less electronic waste is generated, amounting to around 40 percent (DEGERtracker) or 25 percent (DEGER TOPtracker®), respectively, once the operating life has elapsed.

FROM A VISION TO AN IDEA. FROM AN IDEA TO A COMPANY

A success story: DEGERenergie in Horb, Germany

Horb, Germany
12 DEGERtracker 5000HD, 1 DEGERtracker 3000HD



JUST SO WE DO NOT RUN OUT OF IDEAS, WE THINK UP A COUPLE OF NEW ONES EVERY DAY

Research and development: investments in the future

There is no doubt about it – there are technologies that have stood up to the test of time. But those who really want to achieve major improvements must be receptive to new ideas. One result is that we parted company with the inefficiency of rigid systems to develop and successfully introduce intelligent solar tracking systems to the market. In doing so we not only have become one of the pioneers and technology innovators in the field, but also the world market leader with the largest range of products. This expertise is reflected in the strong hands-on orientation our systems have: there is only a minimal amount of wiring work needed at the large solar parks. In addition, the entire control engineering technology is simple to set up and easy to master. “Less is more” is our motto in connection with the module surface drive mechanism. We do not require any rotary encoders, relays or step motors. Neither does the automatic control need any electro-mechanical components. The result is a reliable control and drive technology that is maintenance-free and extremely durable.

Flexibility as a constant. Solar module development has progressed in leaps and bounds over the last few years. Better performance, bigger modules, new manufacturing methods and technologies – numerous manufacturers offer a wide selection of different products. Rapidly changing product lines are often a problem, particularly for installation specialists. So it is nice to have a constant that you can rely on: DEGERtracker tracking systems. They are the most flexible installation system in the market and are suitable for all commercially available module and inverter types. And we keep working at it, to ensure that it stays that way in the future.



Proof of monitored processes: the ISO 9001 certification.



We keep our promises: Fast and flexible delivery.



Quality and precision: highly qualified employees ensure this.



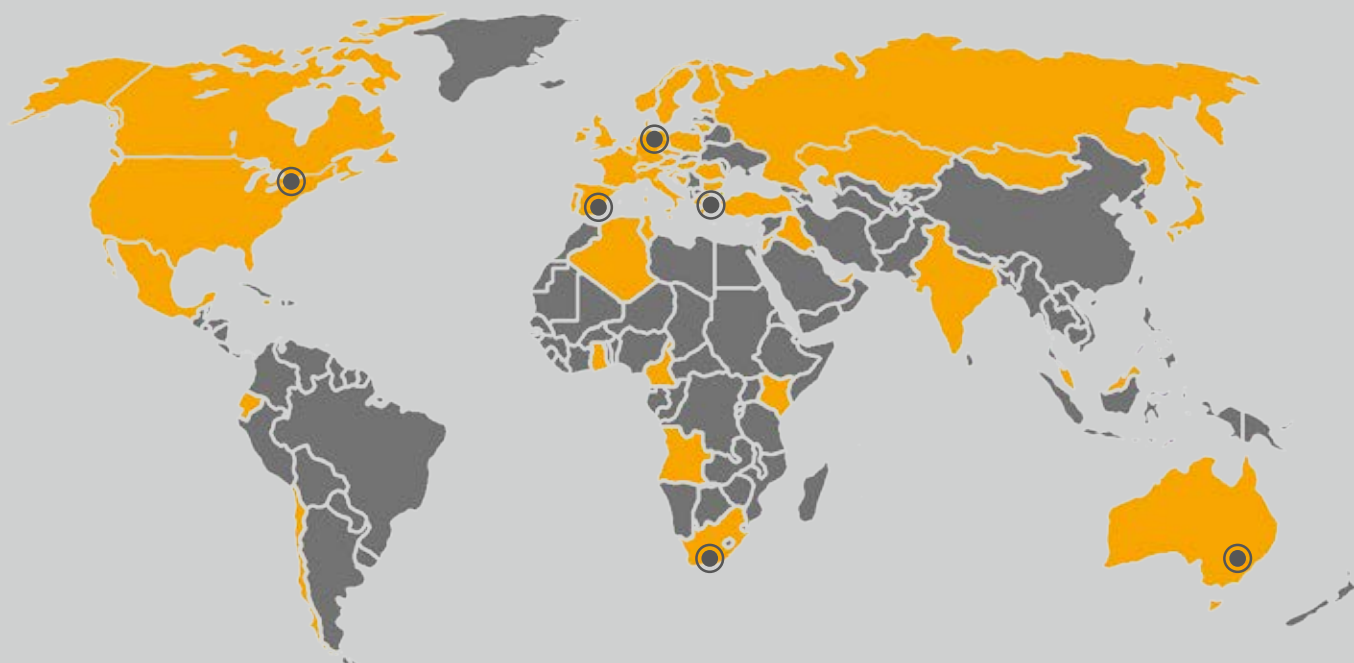
Solar energy is valuable; cost-effective use of it is our goal.

The best prerequisites for best performance. The conveniently located DEGERenergie headquarters is a showcase for a well-planned and well-designed service center with state-of-the-art facilities for logistics, service and administration across an area of about 14,000 m². Qualified employees in all departments ensure a high quality standard and a flexible, fast dispatch of DEGERsystems anywhere in the world.

Searching for the best solutions is a routine daily task to us. Generation, transportation and energy utilization are topics that will be keeping us and future generations extremely busy. That will primarily include mature technologies that produce energy without giving off emissions or wasting natural resources. Solar energy is one of the most sensible approaches to that end. That is why we put a great deal of time and effort into research and development in this field, so that this inexhaustible source of energy can be utilized to the best of human ability. In the last two years we have made a total of more than 120 detail improvements on the existing systems – many of which can be retrofitted and designed for special market conditions. For an energy infrastructure that will also meet the demands of future standards.



Recognition: DEGERenergie was named one of the most innovative enterprises in Germany in 2010. Lothar Späth presents company founder and General Manager Artur Deger with the „Top 100“ Seal of Excellence (Gütesiegel „Top 100“).



● Sales and production locations

■ Installed DEGERenergie systems

DEGERenergie GmbH
Industriestraße 70
72160 Horb am Neckar
Germany

Telephone +49 (0)7451 53914-0
Telefax +49 (0)7451 53914-10
info@DEGERenergie.com

www.DEGER.biz

INFO:www.unicmar.ro, e-mail;unicmar@gmail.com, 0744812837