

## THE SUN – Centre of New Energy Concepts

The utilization of renewable energy from the sun's irradiation is the alternative energy technology of the future. The sun's energy potential is virtually inexhaustible—at least for the next 4 Million years, according to estimates. The energy entering the earth's atmosphere exceeds daily consumption 10-15 fold. Apart from passive utilization through the various technologies offered by solar architecture, solar energy can be used actively: with photovoltaic installations generating “clean” electricity.

### Photovoltaic Solar System:

- 1 Solar generator ELT of 12 photovoltaic panels **KYOCERA** of polycrystalline silicon of 125 Wp (total power 1,500 Wp).
- 1 Structure-mast solar tracker **DEGER 1600EL** with pursuit in 2 axes, 2 pyramidal sensors.
- 1 Sine wave Converter **XANTREX SW3024 CC/CA**, with continuous power of 3300 KW and shipper of 100A 24Vcc.
- 1 Regulator of load and maximization **OUTBACK MX60** of adjustable entrance, with accountant of consumed energy.
- 1 accumulation System with 12 stationary batteries **BAE TAB 10 OPzS** 1000Ah in regime of 10 hours.
- 1 Generator set single-phase

Elements of protection, according to the electrotechnic regulation of low tension RD842/2002 of 2 of August and complementary technical trainings.

- Total annual Consumption (kWh): **2.355/ house**
- Anticipated Production of the installation (kWh) **2.216/ house**
- Autonomy of the system: **3-4 days without solar radiation.**
- Guarantee installation: **3 years** - Guarantee modules: **8 years**
- Maintenance: **3 years**

The photovoltaic generator, made up of several modules that contain the photovoltaic cells, catches & transforms the solar energy into electrical energy in form of DC, that are stored in batteries - accumulation system -, allowing to have electricity at the moment that needs. The converter transforms the DC stored into the storage cell in alternating current 220V 50Hz, which allows that the consumption takes place with conventional electrical and household-electric apparatuses. The load regulator protects the system of accumulation of overloads or excessive unloading.

*Experts for the technical utilization concept for the optimisation of solar energy and market leaders for tracking systems for photovoltaic installations.*

## **Intelligent DEGER Tracking Systems**

The movement of the earth and the composition of the atmosphere lead to constant fluctuations in the intensity and the angle of solar irradiation. As a consequence, the cells of rigid photovoltaic modules are only able to convert a fraction of the light energy given off by the sun into electric energy. DEGERenergie tracking systems are fastening systems for photovoltaic modules. They constantly adapt the angle of PV modules to face the sun, so that the irradiation angle and the light intensity remain constant and a maximum of electrical energy can be generated. This not only helps to exploit every minute of sunshine but also to make the best use of diffuse light – all year round.

This leads to an added solar energy yield of 20 – 25% for single-axis, and 35 – 45 % for dual-axis tracking systems. The result is increased efficiency and thus shorter amortization times or higher profits. DEGER tracking systems pay!

### **DEGERtraker 1600EL**

- **Maximum solar yield...**can be achieved with the DEGERtraker tracking system. By using the DEGERtraker tracking system, you are truly acknowledging the signs of our times: not only are you protecting our environment and nature but you are increasing your yield and thus achieving amortisation sooner.
- **Maintenance-free. Long-lived. Recyclable.**

The systems designed to these exacting parameters are mass-produced in an ISO 9001-certified factory under environmentally sound conditions.

DEGERtraker systems are truly 100% recyclable. Compared with rigid systems, the amount of electronic scrap after useful life is 40% lower!

- **Quick installation.**

Pre-assembled components and detailed instructions allow installation within less than two hours (after the mast has been erected).

- **A technology to rely on.**

The fact that the patent-protected control system and the utility model-protected mechanical system were awarded the inventor's prize of the federal state of Baden-Württemberg in 2000 shows that the DEGERtraker meets the demands of both experts and investors.

The proven static design of the DEGERtraker is based on DIN 1055-4 (8.86) and DIN 1056 (10.84).

- **Efficiency...**using the example of a 100 kWp installation in a region where rigid systems yield ca. 950 kWh / kWp per year.

Rigid system yield in 20 yrs: 1,900,000 kWh at 43 ct/kWh = 817,000

DEGERtraker yield in 20 yrs: 2,660,000 kWh at 43 ct/kWh = 1,143,800

#### **Profit**

**326,800 kWh**

Higher purchase price of DEGERtraker vs. rigid approx. 60,000

**End profit 266,800**

## ... greater yield – double the return

- **Available at any time:** from your solar equipment retailer.

### DEGERtracker technical data

For solar energy capacity	200 – 2.200 Wp
Module area up to	16 m <sup>2</sup>
Burden	5.000 kg
Rotation angle east-west	360° with adjustable limit switches
Elevation inclination angle	15...90°
Operating voltage	9...34 VDC, 40...370 VDC oder 30...265 V~AC
Control unit	DEGERconecter
East-west drive	Maintenance-free drive integrated in the power head
Elevation drive	linear drive, 90 cm stroke path
Power supply	- directly from the solar module or string - from a battery for stand-alone-systems - from the AC grid - or from an additional 1-5 Wp solar module for selfsufficient systems
Internal power consumption: control mode	0,2 Watt
during drive operation	3 Watts
Power consumption per year	1,5-2 kWh
Mast length	3,5-7 m
Weight (without mast)	350 kg
Maintenance	maintenance-free
Geographic regions	between 25th ... 90th degree of latitude North & South

### The Patented Control ...

... and the mechanics which are registered as a utility model ensure that you can rely on our technology. The DEGERconecter control recognizes the brightest spot in the sky and adjusts the module surface to that position. The mechanics allow the accurate adjustment of the module surface to face the sun all year round.

### This technology also works in cloudy, rainy or foggy conditions.

If, for instance, a day starts off sunny with clouds moving in from the west in the afternoon, the module surface will then move back slightly towards the east. On a completely overcast day, the module surface is adjusted to a horizontal position, or to face the point of the strongest irradiation, making the most out of adverse weather conditions.

## DEGERconecter

### Accurate adjustment ...

The DEGERconecter always adjusts the solar installation to face the brightest point in the sky. It includes the entire system control.

### ... Maximum power yield

During times of sunshine the module surface is accurately adjusted to face the sun. During times of overcast weather, the DEGERconecter automatically adjusts to face the point with the strongest global radiation.

### **A control system to rely on.**

The patent-protected **DEGERconnector** control was awarded the inventor's prize of the federal state of Baden-Württemberg in 2000.

### **Description of DEGERconnector functions**

Two sensor cells in the **DEGERconnector** supply reference values which are evaluated by the logic device, and which provide the basis for the adjustments of the module surface in the course of the day. A third sensor cell is attached to the back of the **DEGERconnector** to reset the installation in the morning. Depending on the irradiation intensity, a differential amplifier controls the transition from the logarithmic characteristic curve during strong irradiation to a linear characteristic curve during low currents in diffuse light. That means that the logic device accepts a much higher value for the linear characteristic curve than for the logarithmic characteristic curve. This leads to improved adjustment accuracy in dimming light. A load is added to the differential voltage, moving the switch-off threshold further into dusk, to ca. 30 W/m<sup>2</sup>.

### **Drive control**

The drive is controlled directly - and without requiring additional parts – by the MOSFET bridge circuit, which is integrated in the **DEGERconnector**. The bridge is characterised by a very low closing resistance. To avoid overload of the motor and the **DEGERtraker's** structure, a current limiter was integrated into the system.

This current limiter functions dynamically, i.e. the motor is switched off as a response to overload (e.g. frozen or blocked drives). As soon as the drive works again, the system is reset automatically.

### **Benefits**

- No computer with high energy consumption required
- No rotation angle potentiometer, relay, step motors ... required
- No networking with data lines required
- The automatic drive does not contain any electromechanical parts
- Little cabling required for large solar parks
- Simple, easy-to-use control technology
- Efficient utilisation even during cloudy weather
- Only makes movements which directly lead to increased power yield.

### **Tasks of an energy converter**

The energy converter exploits wide voltage ranges of solar modules, battery systems and the grid for the **DEGERconnector**.

The power for the control and drive systems may also be supplied without a battery, by direct connection to solar modules with below one Watt power.

We recommend using the solar module as voltage supply to avoid having to regularly exchange batteries and thus increase efficiency.

During dawn, the **DEGERconnector** recognises the brightest spot in the sky and tries to reset the installation. The power supply module for the control system starts by producing 0.01 Watts or less, and as soon as the **DEGERconnector** attempts to control the electric motor, the voltage on the solar module breaks down. To avoid the **DEGERconnector** switching the drive on and off all the time and to achieve quick resetting, **DEGERenergic** has developed the energy converter.

The energy converter collects even small power inputs from the solar module (which are too small to be fed into the grid) in a high performance condenser and makes this energy available to the **DEGERconecter**. The **DEGERconecter** is thus able to reset the installation to face the brightest spot even before the modules produce enough energy to be fed into the grid. To avoid both drives from working simultaneously, the energy converter gives the east-west drive priority over elevation. The energy converter also ensures that no more than ca. 1-3 Watts is taken from the solar module while the drive is running. The control does not use any energy during the night.

#### DEGERconecter technical data

<b>Input voltage</b>	18...50 VDC
<b>External input fuse</b>	5 Ampere
<b>Internal power consumption at night</b>	0 Watts
<b>Internal power consumption control mode</b>	max. 0,03 Watts
<b>Input protection</b>	reverse polarity protection diode max. 5 A
<b>Output voltage</b>	see input voltage
<b>Output on motor side</b>	short-circuit proof, reverse polarity protected
<b>Motor protection</b>	overload recognition, current limitation
<b>Switching capacity loss-free</b>	4 Ampere
<b>Peak switching capacity</b>	9 Ampere
<b>Adjustment accuracy in sunshine</b>	< 2°
<b>Adjustment accuracy in diffuse light</b>	< 6 %
<b>Measurements</b>	edge length 80 mm
<b>Weight</b>	90 gr
<b>Energy converter I</b>	<b>Energy converter III</b>
<b>Input voltage</b> 9...34 VDC	<b>Input voltage</b> 40...370 VDC oder 30...265 VAC
<b>Connection</b> independent of polarity	independent of polarity
<b>Output voltage</b> 23 VDC	23 VDC
<b>Power consumption max</b> 3 Watts	5 Watts
<b>Internal power consumption control mode</b> 0,2 Watt	0,2 Watt
<b>Output on motor side</b> short-circuit proof	short-circuit proof
<b>Measurements</b> 130x130x80mm	130x130x80mm

#### Functioning

The **DEGERconecter** control unit detects the brightest spot in the sky and adjusts the module surface's position to face it. The **DEGERtraker**'s mechanical system allows the accurate adjustment of the module surface to the sun all year round.



[www.DEGERenergie.de](http://www.DEGERenergie.de)