

# Operating Manual

## DEGERcontrolsystem consisting of Energy Converter 6 and Central Control Box III

Status 2012-02-01

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### **Abbreviations and Glossary**

AZ	=	Azimuth
CCB	=	Central Control Box
EK	=	Energy converter
EL	=	Elevation
MLD	=	Maximum Light Detection

# Operating Manual DEGERcontrolsystem with EK 6 and CCB III Section I - General Functional Description of MLD Technology

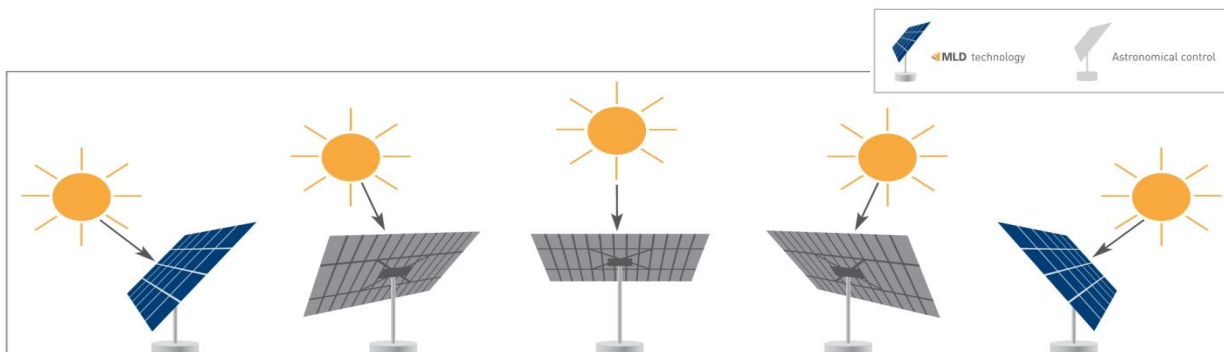


## Area of Application

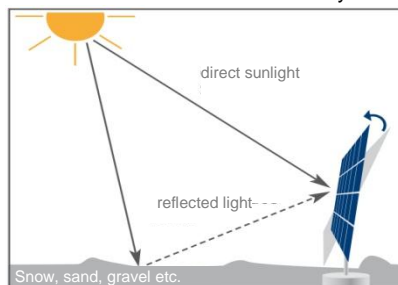
The patented DEGERcontrolsystem provides you with the opportunity to operate a dual-axis DEGERenergie solar tracking system and thus to attain maximum yield with your photovoltaic system.

## Operating Mode

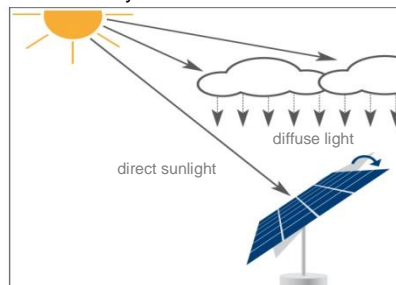
The DEGERconector control system recognizes the brightest point in the sky and rotates the module surface in that direction. The DEGERtraker mechanism makes it possible for the module surface to be precisely positioned to receive the maximum sunlight at all times throughout the entire year. This technology is also effective when it's cloudy, raining or foggy: i.e. if a cloud cover starts moving in from the West on a initially sunny afternoon, the module surface will turn back somewhat to the East in corresponding adjustment to the irradiation. If the cloud cover is solid and blocks off the entire sky, the module surface will turn in the direction of the strongest irradiation to make the best of even poor weather conditions. The control system is designed to work with maximum efficiency – only those movements are carried out which result in an immediate increased yield.



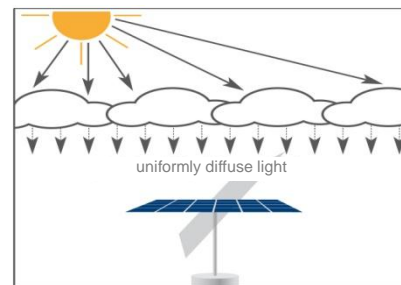
**Sunshine:** The DEGERtraker directly faces the sun all day.



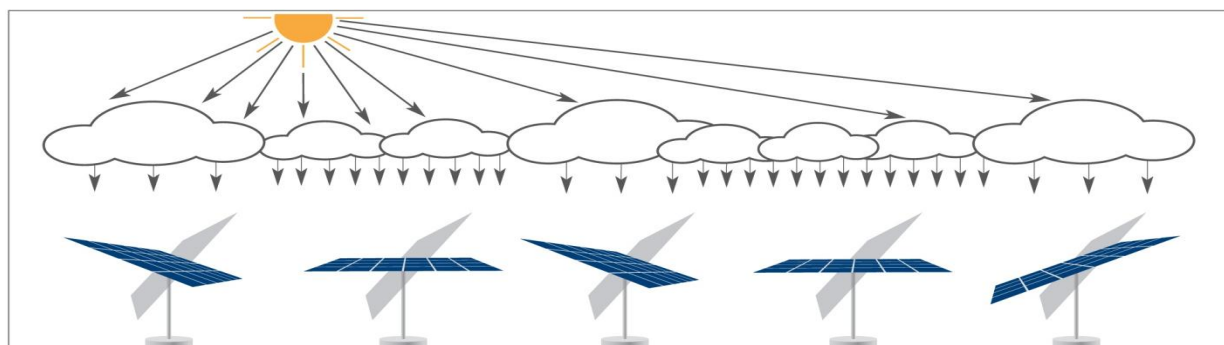
**Reflecting surface:** The DEGERtraker uses direct solar irradiation as well as energy from reflected light.



**Partly clouded:** In addition to the direct solar irradiation, diffused light is also used to maximize the effects.



**Overcast sky:** The DEGERtraker 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 DEGERtraker. The individual control makes sure every DEGERtraker is optimally oriented to the brightest source of irradiation. This guarantees the highest energy yield possible.

## Legend

The following symbols are used within this Operating Manual for special depiction of hazards and/or risks.



**Possible hazardous situations**  
(Death or serious injury can result)

**Danger**



**Possible damage-causing situation**  
(Product or something nearby can be damaged)

**Warning**

## General Precautions



**Danger**

1. Read through all of the operating instructions prior to working with the equipment and keep the manual in a suitable place.
2. There is risk of injury due to live wires or parts during installation or commissioning of the DEGERcontrolsystem.

The DEGERcontrolsystem installation may only be carried out by specialist personnel. We recommend having a master electrician or similarly qualified specialist inspect the installation upon completion.

Service and maintenance work, required tests or changes to the DEGERcontrolsystem may only be carried out by specialist personnel.

3. When conducting maintenance work, required tests or making changes to the DEGERcontrolsystem, power supply to all parts must be shut off by means of an energy-isolating device to be installed on the customer side. The absence of voltage as well as the mechanical safety must be checked and ensured in accordance with the applicable local rules for preventing accidents. Suitable ESD-protection must be applied! Tests or changes to the system may only be carried out by specialist personnel. If it is absolutely essential to conduct a test with a live power supply, then injury to persons or property must be prevented by taking the appropriate steps to rule out such an event occurring.

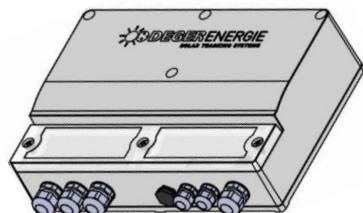
4. The power lines are to be laid so that they pose no risk to any person or property.

# Operating Manual DEGERcontrolsystem with EK 6 and CCB III Section I - General Scope of Delivery

1x Operating Manual

1x Energy converter 6 (EK6) with DEGERconector consisting of:

- 1x Energy converter assembled in a housing



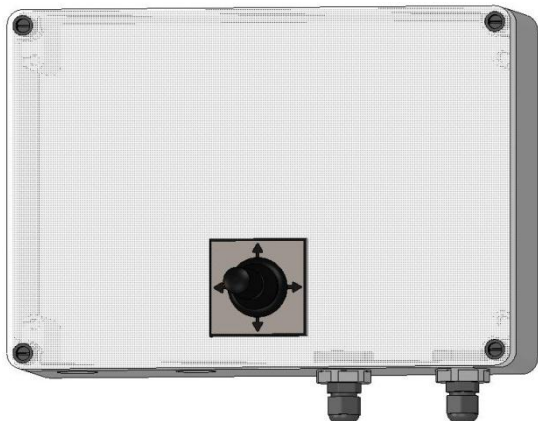
- 1x DEGERconector EL for elevation axis, pre-installed at EK 6



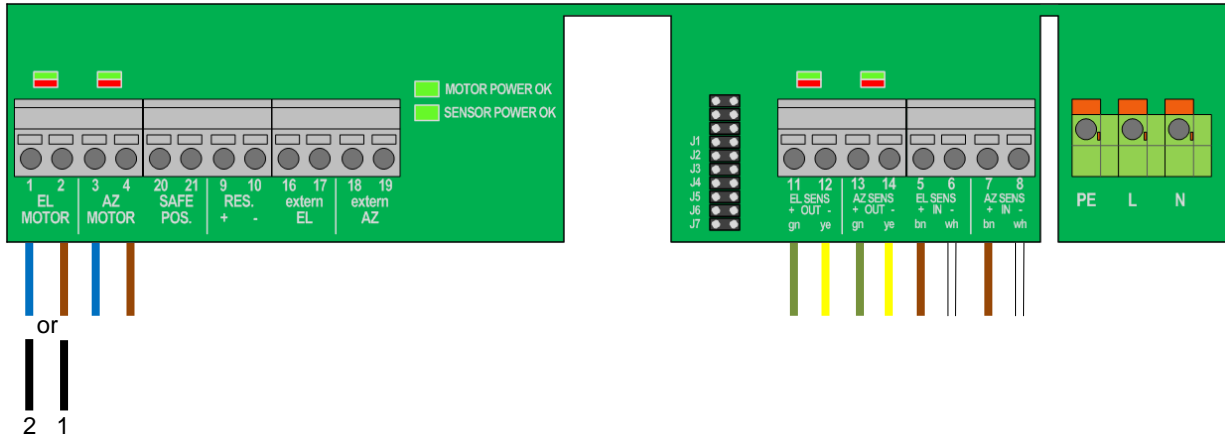
- 1x DEGERconector AZ for azimuth axis, pre-installed at EK 6



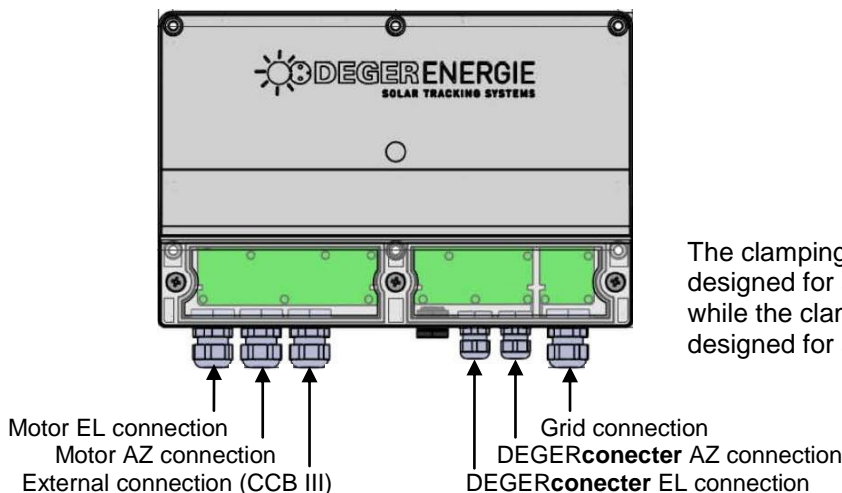
1x Central Control BoxIII (CCBIII) optional  
with a joystick for manual control incl. wind monitoring function



# Operating Manual DEGERcontrolsystem with EK 6 and CCB III Section II - Connection Diagrams Energy Converter



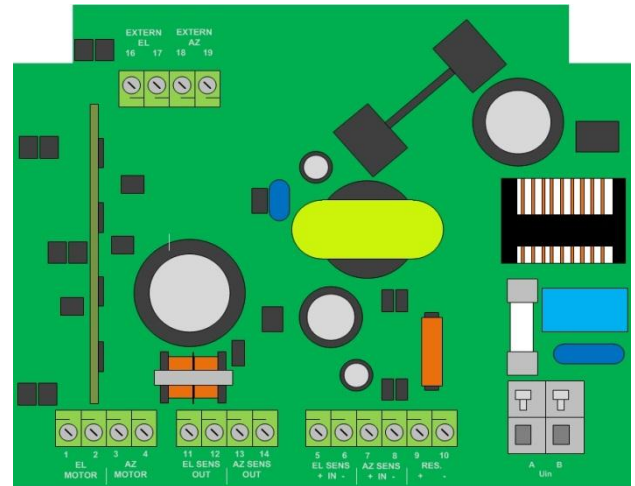
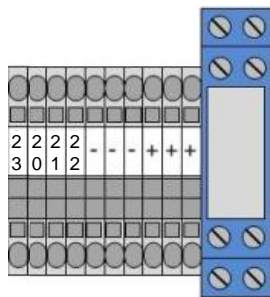
Terminal	Function	Terminal	Function
1-2	Output for EL motor - +/- 24 V DC - 2.5 A Terminal 1 => Wire blue or 2, depending on motor Terminal 2 => Wire brown or 1, depending on motor	11-12	Output for DEGERconector EL - +/- 23 V DC - 0.25 A Terminal 11 => Wire green Terminal 12 => Wire yellow
3-4	Output for AZ motor - +/- 24 V DC - 2.5 A Terminal 3 => Wire blue Terminal 4 => Wire brown	13-14	Output for DEGERconector AZ - +/- 23 V DC - 0.25 A Terminal 13 => Wire green Terminal 14 => Wire yellow
20-21	Input for safety position - +/- 21 V DC - +/- 21 V DC	5-6	Input for DEGERconector EL Terminal 7 => Wire brown +24 V DC Terminal 8 => Wire white 0 V DC
9-10	Output for reserve - 24 V DC - 1.1 A	7-8	Input for DEGERconector AZ Terminal 7 => Wire brown +24 V DC Terminal 8 => Wire white 0 V DC
16-17	Input for external control EL from CCB - +/- 24 V DC +/-10% - 5 mA	PE - L - N	Input for power supply - 100 - 240 V AC - 2 A
18-19	Input for external control AZ from CCB - +/- 24 V DC +/-10% - 5 mA		



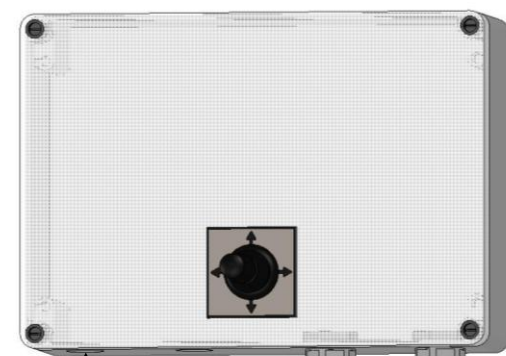
The clamping area on the M12 cable fitting is designed for a cable cross-section of 3 to 6 mm, while the clamping area on the M16 cable fitting is designed for a cable cross-section of 5 to 10 mm.



**Operating Manual**  
**DEGERcontrolsystem with EK 6**  
**and CCB III**  
**Section II - Connection Diagrams**  
**Central Control Box**



Terminal	Function	Terminal	Function
20	Input for control input (flat) for special sensors - 21 V DC	A - B U <sub>in</sub>	Input for power supply - 80 - 380 V DC - 100 - 265 V AC - 1 A
21	Input for control input (upright) for special sensors - 21 V DC	1-2	Remote control for EL axis - +/- 21 V DC - 1.4 A
22	Control input for wind monitor ADVANCED wind monitor STANDARD	3-4	Remote control for AZ axis - +/- 21 V DC - 1.4 A
23	Terminal for wind monitor ADVANCED wind monitor STANDARD		
+	Auxiliary supply output for special sensors - 21 V DC - 1.4 A		
-	Auxiliary supply output for special sensors - 21 V DC - 1.4 A		



↑  
 Connection option for wind monitor

↑  
 Grid connection

↑  
 Energy converter connection (not included in delivery)

The clamping area on the cable fitting is designed for a cable cross section of 3.5 mm to 7 mm.

**Section III - Commissioning and Operation  
Connecting the Energy Converter to the Central Control Box**

**Connecting the energy converter to the Central Control Box III**



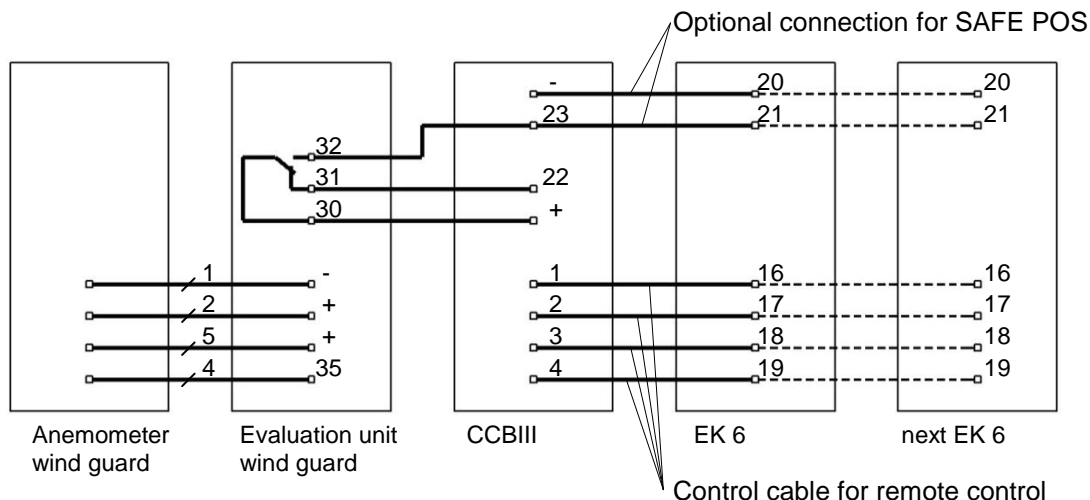
**Danger**

- Connection of the energy converter to the Central Control Box may only be carried out by specialist personnel.
- Connection of the energy converter to the Central Control Box may only be carried out when disconnected from the power supply.

Open the housing cover on the Central Control Box and energy converter, then connect the two devices to each other as follows using a min. 6-wire cable:

**Connecting the energy converter 6 to the Central Control Box III**

with wind guard ADVANCED



**The conductor cross-section of the control cable has to be appropriate for the number of energy converters connected to the Central Control Box and the cable length. The cable for connecting to EK 6 to CCB is not included. To connect the remote control a 4-wire cable is enough, to connect the optional SAFE POS, a 6-wire cable is required.**

The power supply (100 - 240 V) for the energy converter (PE - L - N) and Central Control Box (A-B Uin) must be provided by a qualified technician externally on-site.



**Danger**

- The external power supply must be set up according to the local regulations. It must be possible for the energy converter to be cut off from the supply voltage by means of a safety cut-out switch 10A B or 6A C. It must also be possible for the Control Box to be cut off from the supply voltage by means of a safety cut-out switch 3A B.
- The safety cut-out switch must be readily accessible.



## Operating mode of the energy converter 6

### Function of the control unit

In general, the following definitions apply:

- The external EL input has priority over the AZ sensor and external AZ, otherwise external (AZ and EL) has priority over the sensor (AZ and EL) in general.
- Only one motor (either AZ or EL) may be active at any one time.
- The AZ sensor input always has priority over the EL sensor.

**Reverse polarity function:** If the same signal from the AZ sensor is active on terminals 13-14 for longer than 7 minutes, then the polarity of the output signal is reversed. This reversed signal then remains in place for at least 6 minutes, regardless of which signal is active on terminals 13-14 from the AZ sensor. If a signal is active on the external EL input (terminals 5-6) or AZ input (terminals 7-8), then the reverse polarity function is deactivated. The reverse polarity function can be switched off using the jumper.

**Night function:** If the control system on terminals 11-12 and 13-14 does not detect any sensor signals for over 4 hours, then the system can assume that it is night time. The AZ motor output (terminal 3-4) is then supplied with power for approximately 12 minutes. The system turns back towards the East. This function can be interrupted by the external inputs, wire-break function and sensor inputs. The night function can be switched off using the jumper.

**SAFE POS function:** When the function is active, 24 V DC must be constantly present on terminals 20-21 so that the control system remains in its normal operating condition. When the power is not available on terminals 20-21, the EL motor output (terminals 1-2) is switched permanently and the system moves to the safe position. Signals from other inputs have no effect here. The SAFE POS function can be switched off using the jumper.

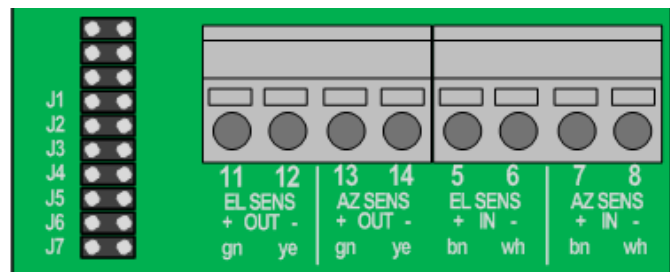


**Danger**

**Changing the configuration from “SAFE POS on” to “SAFE POS off” represents a massive intrusion into the safety features of the system. Damages to the system as a result of a storm cannot be ruled out.**

### Meanings of the plug positions

- J1 plugged in: Reverse polarity function on
- J2 plugged in: SAFE POS function off
- J3 plugged in: Night function for southern hemisphere on
- J4 plugged in: Night function for northern hemisphere on
- J5 plugged in: Night function off
- J6 plugged in: Reverse polarity function off
- J7 plugged in: SAFE POS function on



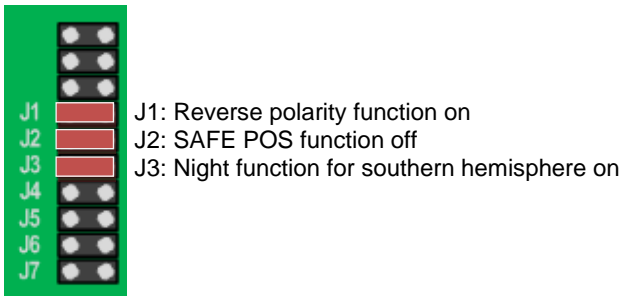
# Operating Manual DEGERcontrolsystem with EK 6 and CCB III



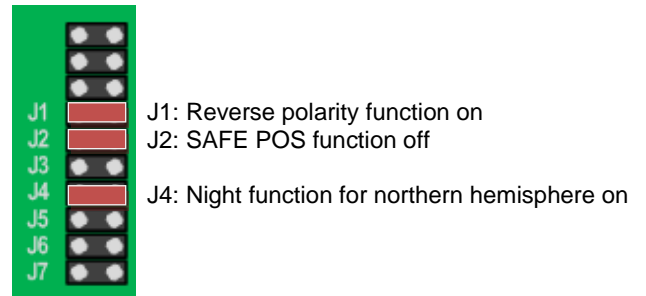
## Section III - Commissioning and Operation Operating Mode of the Energy Converter 6

### Plug positions on delivery

When delivered in the southern hemisphere, the J1, J2 and J3 jumpers are plugged in:



When delivered in the northern hemisphere, the J1, J2 and J4 jumpers are plugged in:



For activation of the wire brake detection, the jumper J2 („SAVE POS function off“) has to be plugged into jumper position J7 (“SAVE POS ON“). For wiring between CCB and EK6 has to be used a 6 lead wire.

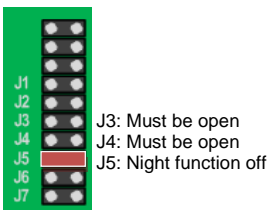
### Adjusting the configuration



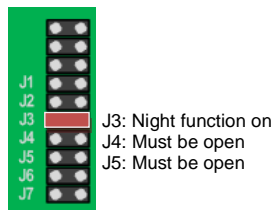
**Danger**

- Changes made to the configuration by adjusting the jumpers may only be carried out by specialist personnel.
- Changes made to the configuration by adjusting the jumpers may only be carried out when disconnected from the power supply.

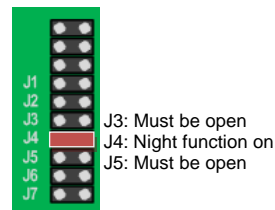
Night function off:



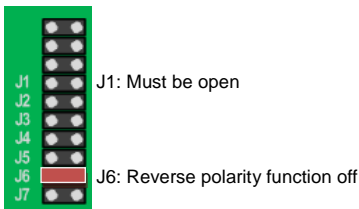
Night function for southern hemisphere on:



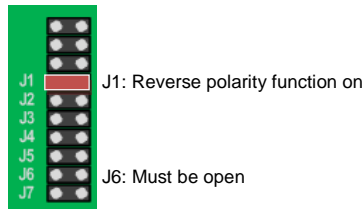
Night function for northern hemisphere on:



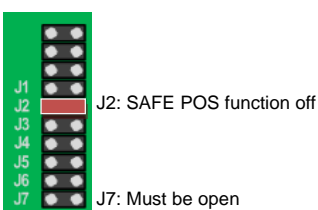
Reverse polarity function off:



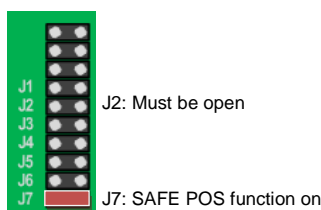
Reverse polarity function on:



SAFE POS function off:



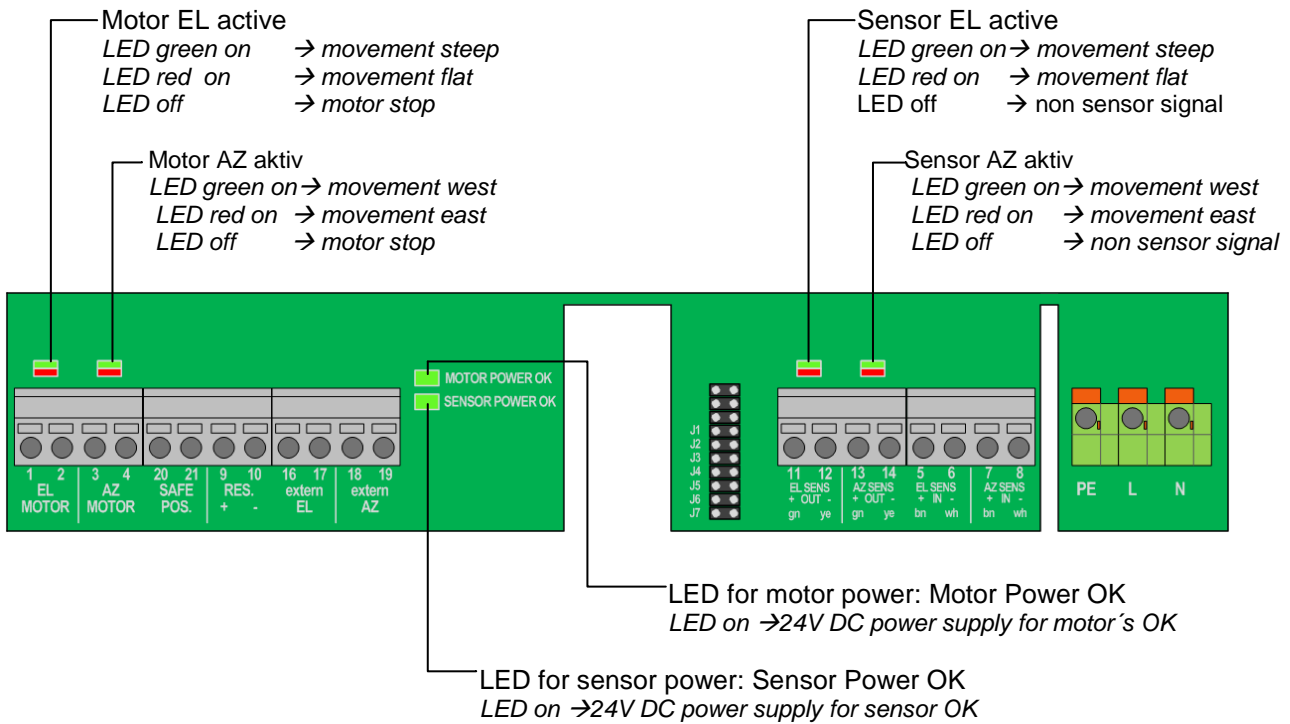
SAFE POS function on:



# Operating Manual DEGERcontrolsystem with EK 6 and CCB III

## Section III - Commissioning and Operation Operating Mode of the Energy Converter 6

### Meanings of the LEDs

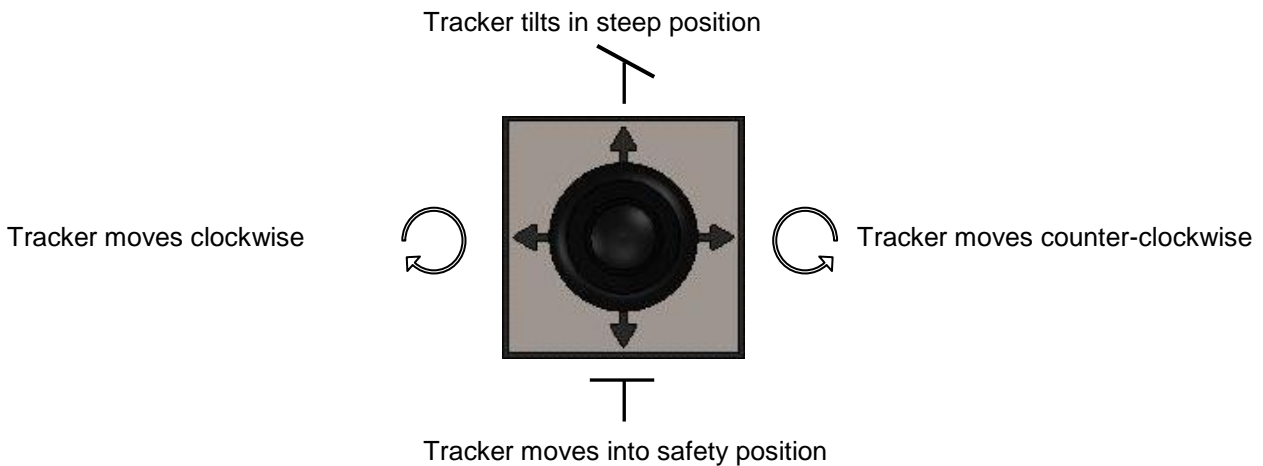


If motor work in opposite direction than indicated by the LED swap the wires of the motor. Refer to connection diagram on pages II-1 and II-2.

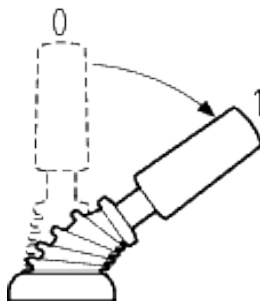
**Section III - Commissioning and Operation  
CCB Operating Principles**

**CCB Operating principles**

It's possible to control up to 200 DEGERtrakers manually using the optional CCB. Activating the joystick can override the automated operation. Every installation connected to the CCB will move in the direction the joystick determines.



If the joystick is brought back into the neutral position (0), all the DEGERtrakers return to the automatic operation mode.



**Warning**

**The system is designed for operatig at a temperature range between -20°C and +50°C. If the DEGERtraker is used outside this range, additional inspection measures must be taken. These include in particular checking the mechanical and electrical components for ice build-up. A proper functioning of the system cannot be guaranteed outside the specified temperature range.**

## Commissioning



**Danger**

**The system should only be commissioned when all installation work has been completed in accordance with the operating instructions by specialist personnel. Ensure that no persons or objects are found in the pivot range of the system.**

- Close the housing cover on the Central Control Box
- Close the housing cover on the energy converter
- **Tightening torque on screw-type terminal = 1.8 Nm (finger-tight)**
- Switch on the supply voltage for the Central Control Box
- Switch on the supply voltage for the energy converter

As soon as the energy converter is supplied with power, the **DEGERtraker** will automatically turn to the sun or the brightest spot in the sky. The system will now operate independently. Ensure that no persons or objects are found in the pivot range of the **DEGERtraker**.

When commissioning the system all connected **DEGERtrakers** are to be checked with the aid of the remote control (CCB). It must be checked that all **DEGERtraker** move in the same direction when the joystick is operated, and stop when the limit switch position is reached. Should you suspect that the limit switches are not functioning, these must be checked on the respective system. The systems must only be allowed to operate independently when these tests have been successfully completed.

**Section III - Commissioning and Operation  
Cleaning, Maintenance, Disassembly and Waste Disposal**

**Cleaning**

- Soft cloths are to be used for any cleaning that may become necessary.
- No corrosive or other aggressive liquids may be used.
- The safety instructions contained in this operating manual must be adhered to.

**Maintenance**

No special service and maintenance work is required at the CCB and the EK 6.

**Disassembly and waste disposal**



**Danger**

- **The system must be disconnected from the power supply before disassembling the energy converter or Central Control Box.**
- **Disassembly may only be carried out by specialist personnel.**

After disassembly, the parts must be disposed of according to local and national regulations.



# Operating Manual DEGERcontrolsystem with EK 6 and CCB III



## Section IV - Technical Data Energy Converter and Central Control Box

### Energy Converter 6:

Input voltage	100 - 240 V AC	
Mains frequency	50 - 60 Hz	
Rated current	2 A	
Output voltage	U1 (Motor) 24V DC	U2 (Conectors) 23 V DC
Output current nominal	2,5 A	50mA
Output current peak (for max. 200ms)	14 A	
IP protection rating	IP 54/CAT 2 / UL50 Type 3R	
Dimensions	245mm x 162mm x 66mm	
Weight incl. 2 DEGERconector	ca. 2 kg	

### Climatic conditions according to DIN EN 50178:1998-04:

Permissible installation above sea level	max. 2000m	
Allowable ambient temperature	-20°C - +50°C	
Extended humidity range	5 - 95 %	
Extended air pressure range	70 kPa - 106 kPa	
Sound level	Distance 20m:	no difference to the sound level of the surrounding measurable 40 dB(A)
	Distance 10m:	

### Central Control Box III:

Input voltage	100 - 240 V AC
Mains frequency	50 - 60 Hz
Rated current	1 A
Output voltage	21V DC
Output current	1,4 A DC
IP protection rating	IP 54 / UL50 Type 3R
Dimensions	250mm x 180mm x 160mm
Weight incl. wind monitor	ca. 4 kg

### Climatic conditions according to DIN EN 50178:1998-04:

Permissible installation above sea level	max. 2000m	
Allowable ambient temperature	-20°C - +50°C	
Extended humidity range	5 - 95 %	
Extended air pressure range	70 kPa - 106 kPa	

# Operating Manual DEGERcontrolsystem with EK 6 and CCB III

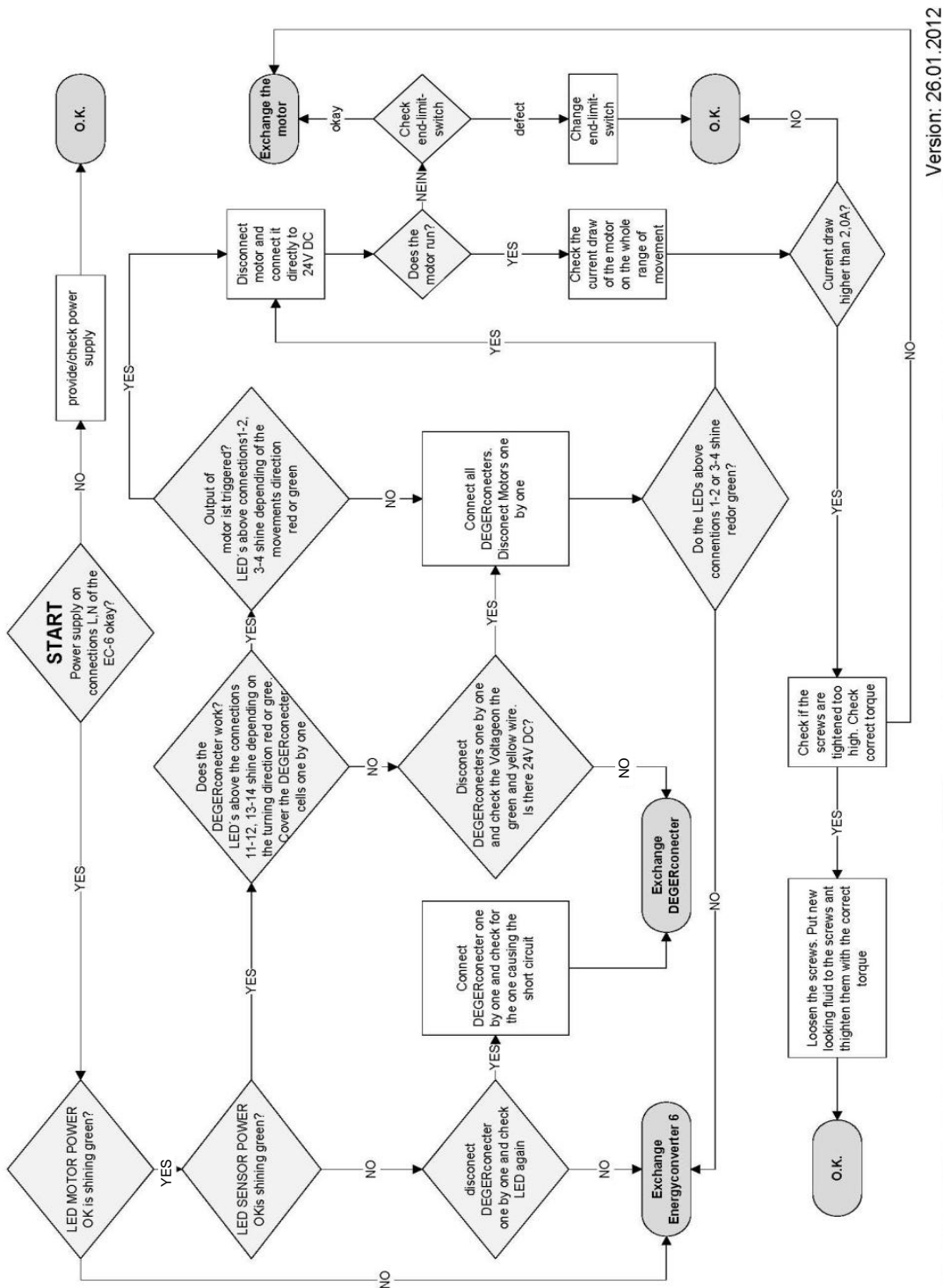


## Section V - Trouble Shooting Error Search Plan Energy Converter



In the case of inspections or modifications to the DEGERtraker all electrical parts need to be disconnected from line-power by an electrical separator or breaker. It is important to ensure the technical security and the absence of voltage has been verified. When voltage supply is imperative for checking the system, injuries of persons have to be prevented by appropriate actions.

### Troubleshootingplan for DEGERtraker with Energiekonverter 6



Version: 26.01.2012

The application of the troubleshooting plan presented above enables a target-oriented troubleshooting.

To exchange defective parts, please contact us with the fault report located in these instructions. We will promptly ship you the necessary replacement parts including detailed exchange instructions.

# Protocols – Fault report DEGERcontrolsystem



To assist in case of problems with our systems it is necessary to have this fault report on hand.  
Without a completely filled out fault report there cannot be any support provided!!

Please send this report to the following fax number **+49 7451 5391410**

or scan and email to

**service@degerenergie.com**

Please provide a phone number to contact you.

**RECALL-NUMBER:** \_\_\_\_\_ (required)

**Fault report from** \_\_\_\_ . \_\_\_\_ . \_\_\_\_

## 1 Information about the system

- |   |   |   |  |
|---|---|---|--|
| <input type="checkbox"/> TOPtraker 6.1 (since 2002)   | <input type="checkbox"/> 300EL (1999 to 2010)       | <input type="checkbox"/> 3000NT (since 3/2008)  | <input type="checkbox"/> 3000HD (since 5/2008) |
| <input type="checkbox"/> TOPtraker 8.5 (since 4/2008) | <input type="checkbox"/> 1000/1200EL (1999 to 2002) | <input type="checkbox"/> 5000NT (since 10/2005) | <input type="checkbox"/> 5000HD (since 5/2008) |
| <input type="checkbox"/> TOPtraker 25HD (since 2008)  | <input type="checkbox"/> 1600EL (2002 to 3/2008)    | <input type="checkbox"/> 6000NT (since 9/2010)  | <input type="checkbox"/> 3000CT (since 1/2010) |
| <input type="checkbox"/> TOPtraker 40NT (since 2008)  | <input type="checkbox"/> 2500EL (2003 to 2005)      | <input type="checkbox"/> 7000NT (since 8/2006)  | <input type="checkbox"/> 5000CT (since 1/2010) |
|   | <input type="checkbox"/> 4000EL (until 2006)        | <input type="checkbox"/> 9000NT (since 8/2010)  |  |

date of delivery	204- serial number EC 6	<input type="checkbox"/> individual DEGERtraker <input type="checkbox"/> plant with trackers	serial number(s) DEGERtraker
energy-converter-type: <input type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> V <input type="checkbox"/> 6	Windguard/control-type <input type="checkbox"/> ELERO <input type="checkbox"/> ELTAKO <input type="checkbox"/> CCB I <input type="checkbox"/> CCB II <input type="checkbox"/> CCB III	Anemometer type <input type="checkbox"/> ELTAKO/BASIC <input type="checkbox"/> STANDARD <input type="checkbox"/> ADVANCE	power-supply-energy-converter Voltage: V, <input type="checkbox"/> AC, <input type="checkbox"/> DC
assembly: <input type="checkbox"/> free standing <input type="checkbox"/> integrated in building			total height (top edge of module-surface over ground) m

If your system is equipped with an Energy Converter 6 (EC 6), the power supply (24V/DC) to the motors and DEGERconnecters can be checked on the LEDs above the connection clamps. Please follow the trouble shooting chart for the EC 6. This chart can be found in the assembly instructions or the operating manual of your system.

## 2 Measurement

function-control:			o.k.?
East-West drive rotates to the brightest spot (cover one sensor cell)			<input type="checkbox"/>
Elevation drive moves to the brightest spot (cover one sensor cell)			<input type="checkbox"/>
by activating wind-guard the DEGERtraker moves into horizontal position			<input type="checkbox"/>
Measured data at the energy-converter		gain	measured
power supply	clamp A-B		V
DEGERconnecters:			
power supply to DEGERconector elevation	clamp 5-6	20-24V	V
output from DEGERconector elevation	clamp 11-12	20-24V	V
power supply to DEGERconector east-west	clamp 7-8	20-24V	V
output from DEGERconector east-west	clamp 13-14	20-24V	V
Motors:			
power supply to motor elevation	clamp 1-2	20-24V	V
power supply to motor east-west	clamp 3-4	20-24V	V
current consumption motor elevation		0,4-1,1A	A
current consumption motor east-west		0,4-1,1A	A

**To give you a quick help this completely filled in form is required.**

**Without a completely filled in form the processing of complaints is not possible!**

For guarantee claims a copy of the delivery note is required additional.

Send the completely filled in form to:  
[service@degerenergie.com](mailto:service@degerenergie.com)  
or by Fax: +49 7451 53914-10 to DEGERenergie.

**We'll get in contact to you.  
Thank you for your cooperation.**

## 3 Data

<b>Contact</b> <input type="checkbox"/> distributor <input type="checkbox"/> installer <input type="checkbox"/> operator  Company / location  Address  ZIP Code / location  Contact person	<b>adress to send defective parts back:</b>  DEGERenergie GmbH - Service - Industriestrasse 70 72160 Horb a.N.
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## 4 Formulation of problem (please continue to write on the next page)

\_\_\_\_\_

## 5 Spare-part(s) with number

\_\_\_\_\_

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# Operating Manual DEGERcontrolsystem with EK 6 and CCB III



## Section VI - Liability

### Liability Disclaimer and Contact Information

#### Liability Disclaimer

The liability provisions included in DEGERenergie GmbH's General Terms and Conditions apply in general. The content of these documents is continually checked and modified as needed. Nevertheless, the occurrence of possible errors cannot be entirely ruled out. No guarantees are given in regard to the completeness of the content. The respective current version can be obtained from the internet at [www.DEGERenergie.de](http://www.DEGERenergie.de) or through the usual distribution channels.

We are not liable for warranty or liability claims in regard to damages of any kind if the following causes are found to apply:

- The product was used improperly or for purposes other than its intended use.
- Operation of the product in an environment it was not designed to tolerate
- Operation of the product when it was not in compliance with locally relevant legal safety regulations
- If the precautionary and/or safety instructions for the product that are contained in all documents related to it were not adhered to
- Operating the product under flawed safety and security conditions
- Unauthorized product modifications were made
- Faulty product functioning caused by connected or neighboring devices performing outside of the legally permissible limits
- Disaster situations or force majeure
- Guarantee-label destroyed!

#### Contact

Should there be any questions about the product, DEGERenergie would be happy to answer them for you.

DEGERenergie GmbH  
Industriestrasse 70  
D- 72160 Horb am Neckar

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Fax: +49 (0) 7451 / 53914-10  
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[www.DEGERenergie.com](http://www.DEGERenergie.com)

**Operating Manual  
DEGERcontrolsystem with EK 6  
and CCB III  
Section VII - Connection Diagramms  
DEGERcontrolsystem to DEGERtraker**

The complete controlsystem in overview:

