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|-----------------------------------|---|
| Product Certificate Number | 20297-2-A-CER |
| Applicant | NCLAVE RENEWABLE S.L. Avenida de Burgos 114, 2º 28050. Madrid. SPAIN Trina Solar Co., Ltd. NO.2 Tianhe Road, Trina PV Industrial Park, New District. Changzhou, Jiangsu. China 213031. |
| Model/ | SP1000 |
| Type of unit | Solar tracker single axis |
| Technical Data | See page 2 and 3 |
| Design Standard | IEC 62817:2014: Photovoltaic systems. Design qualification of solar trackers. |

Having assessed the test report number: 11461-3-TR-E1 performed by Certification Entity for Renewable Energies based on the requirements of the IEC/ISO 17025.

The above-mentioned control tracker unit complies with the requirements of the IEC 62817:2014: Photovoltaic systems – Design qualification of solar trackers.

This certification is according the CERE internal process PET-CERE-09 Rev17 based on the requirements of the EN ISO/IEC 17065:2012. For this certification process the conformity assesment activities was according Scheme Type 5 based on:

- Testing of production samples selected by CERE.
- Audit of quality system according ISO 9001 with registration number ES-0160/2009 issued by a certification body accredited according EN ISO/IEC 17021.
- Inspection of the manufacturing process.

Madrid, at 21st May 2019. This certificate is valid until 21st May 2022

Miguel Martínez Lavin
Certification Manager

| Characteristic | Data |
|--|--|
| Manufacturer | NCLAVE MANUFACTURING S.L.U |
| Model Number | SP1000 |
| Type of Tracker | HSAT horizontal single axis tracker |
| Payload characteristics | |
| Minimum/maximum mass supported | Until 2200 kg per row / until 39600 kg per tracker |
| Payload centre of mass restrictions | Without restriction. According configuration |
| Maximum payload surface area | 148 m ² / per row |
| Nominal payload surface area | 148 m ² / per row |
| Maximum dynamic torques allowed while moving | 80 kN (motor 1,1 kW) 110 kN (motor 1,5 kW) |
| Maximum static torques allowed while in stow position | 200 kN (total force on the actuator line) |
| Installation Characteristics | |
| Allowable foundation | Direct ram / micropyle |
| Foundation tolerance in primary axis | Axial: $\pm 3^\circ$ N-S Lateral: $\pm 1,5^\circ$ E-W or $\pm 1,25$ cm between base end and top end Spin: $\pm 5^\circ$ Height: ± 30 mm |
| Foundation tolerance in secondary axis | $\pm 3^\circ$ N-S |
| Installation effort | 1092 h/MW – 258 h/MW |
| Electrical characteristics | |
| Includes backup power | NO |
| Daily energy consumption | 392 Wh/day |
| Stow energy consumption | 19,7 Wh/day |
| Input power requirements | 230 Vac + PE, 50/60 Hz 8,5 A |
| Effective (and apparent) peak power consumption tracking | 249 W (466,45 VA) |
| Effective (and apparent) peak power consumption non-tracking | 14,36 W (39,15 VA) |
| Effective (and apparent) peak power consumption stow positioning | 551,08 W (868,94 VA) |
| Tracking accuracy | |
| Wind speed during the tests | < 4 m/s |
| Weight and area of payload installed during testing | 10000 kg and 840 m ² |
| Payload center of mass installed during testing | 140 mm from the center of the rotating axis |
| Control characteristics | |
| Control algorithm | Hybrid with backtracking |
| Control interface | Human-machine interface and remote |
| External communication interface | ModBus (RS-485, Ethernet, Optic fiber) |
| Emergency stow provided | YES (high wind speed $> 16,67$ m/s during 5 seconds, moves the tracker to security position) |
| Stow time | 2 minutes and 43 seconds |
| Clock accuracy | Maximum deviation of 2 minutes per month, synchronized every day by communications |
| Hard limit switches | 2 proximity sensors |
| Mechanical design | |
| Actuation type | Combined |
| Drive type | Electric |
| Motor | AC 1,1 kW / AC 1,5 kW |
| Range of motion, primary axis | -55° to $+ 55^\circ$ |
| Range of motion, secondary axis | NA |

| Environmental conditions | |
|--|--|
| Maximum allowable wind speed during tracking | Three wind thresholds |
| Maximum allowable wind speed in stow | 54 m /s |
| Temperature operational range | -5° to +50° |
| Temperature survival range | -5°C a 50°C |
| Snow rating | Specific for each project |
| Maintenance and reliability | |
| Maintenance schedule | According NCLAVE specific maintenance manual |

The sample selected to test was representative of the production.
The sample was selected in.

Sample Report Number

The inspection of manufacturing process was performed in:
On June 28 of 2017

Inspection Report Number:

NCLAVE Manufacturing S.L.
P.I. La peña Crta. NA 134-km93
31230. Viana. Navarra. SPAIN
March 08, 2017
11461-1-TM

NCLAVE Manufacturing S.L.
P.I. La peña Crta. NA 134-km93
31230. Viana. Navarra. SPAIN
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11461-IF

