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| Product Certificate Number | 20827-CER-E1 |
| Applicant | <p>NCLAVE Renewable S.L.U Av. de Burgos 114, 2º. 28050. Madrid, Spain</p> <p>Trina Solar Co. Ltd. No. 2 Tianhe Road, Trina PV Industrial Park, New District Changzhou, Jiangsu. China. 213031.</p> |
| Model | VANGUARD |
| Type of unit | Horizontal single axis tracker |
| Technical Data | See page 2 and 3 |
| Standard | IEC 62817:2014+A1:2017 Photovoltaic system – Design qualification of solar trackers |
| <p>Having assessed the report number: 20827-TR performed by Certification Entity for Renewable Energies and test report number 70.407.21.055.01-00 performed by TÜV SÜD Certification and Testing (China) Co., Ltd. based on the requirements of the ISO/IEC 17025:2017.</p> <p>The above-mentioned solar tracker complies with the requirements of the:</p> <p>IEC 62817:2014+A1:2017 Photovoltaic system – Design qualification of solar trackers</p> <p>This certification is according the CERE internal process PET-CERE-09 Rev 30 based on the requirements of the EN ISO/IEC 17065:2012. For this certification process the conformity assessment activities were based on:</p> <ul style="list-style-type: none"> • Audit of quality system according ISO 9001 with certificate number: ES105154-1 issued by a certification body accredited according EN ISO/IEC 17021. • Inspection of the manufacturing process. <p>This certificate cancels and supersedes the certificate number 20827-CER issue on December 22, 2020</p> | |
| <p>Madrid, May 21, 2021. This certificate is valid until October 21, 2023</p> <p style="text-align: right;">Miguel Martinez Certification Manager</p> | |

Characteristics table

| Characteristic | Data | | |
|--|--|-----------------------------|---------------|
| Manufacturer | NCLAVE Manufacturing S.L.U | | |
| License holder | NCLAVE RENEWABLE S.L.U / Trina Solar Co. Ltd. | | |
| Model Number | VANGUARD | | |
| Type of Tracker | HSAT horizontal single axis tracker | | |
| Payload characteristics | | | |
| Minimum/maximum mass supported | Until 3200 kg per line | | |
| Payload center of mass restrictions | Without restrictions | | |
| Maximum payload surface area | 300 m ² /per line | | |
| Nominal payload surface area | 240 m ² /per line | | |
| Maximum dynamic torques allowed while moving | 22,5 kN m per actuator | | |
| Maximum static torques allowed while in stow position | 83 kN m per actuator | | |
| 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 | + - 3° N-S | | |
| Installation effort | 910 h/MW – 214 h/MW | | |
| Electrical characteristics | SL-SPT-ZB-PV /self-powered TCU | SL-TCU / single line | H5-C |
| Includes backup power | Yes | No | Yes |
| Daily energy consumption | 412,10 Wh/day | 373,79 VAh/day | 139,32 Wh/day |
| Stow energy consumption | 10,14 Wh/day | 16,52 VAh/day | 13,67 Wh/day |
| Input power requirements | 26...46 Vdc | 230 Vac | 25...50 Vdc |
| Effective (and apparent) peak power consumption tracking | 59,71 W | 42,87 VA | 48,11 W |
| Effective (and apparent) peak power consumption non-tracking | 21,92 W | 15,14 VA | 4,00 W |
| Effective (and apparent) peak power consumption stow positioning | 43,13 W | 91,45 VA | 61,10 W |
| Tracking accuracy | | | |
| Accuracy, typical (low wind) | 0,37 | | |
| Accuracy, 95 th percentile (low wind) | 0,94 | | |
| Accuracy, typical (high wind) | 0,41 | | |
| Accuracy, 95 th percentile (high wind) | 1,03 | | |
| Control characteristics | | | |
| Control algorithm | Hybrid with backtracking | | |
| Control interface | Human-machine interface and remote interface | | |
| External communication interface | ModBus (RS-485, Ethernet, Zigbee, Lora, Optical fiber) | | |
| Emergency stow provided | YES | | |
| Stow time | 5 minutes and 30 seconds | | |
| Clock accuracy | Maximum deviation of 2 minutes per month, synchronized every day by communications | | |

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| Hard limit switches | Limit of angle by overcurrent |
| Mechanical design | |
| Actuation type | Distributed |
| Drive type | Electric drive |
| Actuators | AHM3S / AHM2S AC 0,18 kW / DC 0,15 kW |
| | PA11 / PA13 / PA14 / PA15 26Vdc / 6,0A (max) |
| Range of motion, primary axis | -55° to +55° |
| Environmental conditions | |
| Maximum allowable wind speed during tracking | 15 m/s |
| Maximum allowable wind speed in stow | 30 m/s |
| Temperature operational range | -30°C to +60°C |
| Temperature survival range | -40°C to +60°C |
| Snow rating | < 20 cm |
| Maintenance and Reliability | |
| Maintenance schedule | attached in manual |

The inspection of manufacturing process was performed in:
On June 10, 2020

NCLAVE Manufacturing S.L.U
Pol. Ind. La Peña Crta. NA 134. Km-93
31230. Viana, Navarra. Spain

Inspection Report Number:

11461-20-1-IF

RECORD OF CHANGES

| Revision | Modification / Changes | Date |
|----------|---|------------|
| 0 | Initial version / update certificate 20557-CER-E1 | 22/12/2020 |
| 1 | Update to include new linear actuator | 21/05/2021 |
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