Product Certificate Number	**20297-1-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/	SP160
Type of unit	Solar tracker single axis
Technical Data	See page 2 and 3
Design Standard	**IEC 62817:2014:** Photovoltaic systems. Design qualifications of solar trackers.

Having assesed the test report number: 11461-1-TR, 11461-2-TR and 11461-2-TR-E1 performed by Certification Entity for Renewable Energies based on the requirements of the IEC/ISO 17025

The above-mentioned solar tracker 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	SP160	
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	222 m2/per line	
Nominal payload surface area	222 m2/per line	
Maximum dynamic torques allowed while moving	12,25 kN m	
Maximum static torques allowed while in stow position	30 kN m	
Installation Characteristics		
Allowable foundation	Direct ram / micropyle	
Foundation tolerance in primary axis	Axial: ±3º N-S Lateral: ±1,5º E-W or ±1,25cm between base end and top end Spin: ±5º Height: ±30mm	
Foundation tolerance in secondary axis	+- 3º N-S	
Installation effort	910 h//MW – 214 h//MW	
Electrical characteristics		
Control board	Sistemas 2002	P4Q
Includes backup power	NO	Selfpowered
Daily energy consumption	161,67 Wh	88,37 Wh
Stow energy consumption	13 Wh	12,07 Wh
Input power requirements	230 Vac + PE, 50/60 Hz, 2A	50 Vdc, 1,5-2A
Effective (and apparent) peak power consumption tracking	165W (324VA)	77,783 (86,814VA)
Effective (and apparent) peak power consumption non-tracking	9,96W (30,3VA)	4,653 (22,577VA)
Effective (and apparent) peak power consumption stow positioning	258,6W (472VA)	304,412(310,985VA)
Tracking accuracy		
Wind speed during the tests	< 4 m/s	
Weight and area of payload installed during testing	2000 kg and 180 m2	
Payload center of mass installed during testing	90 mm from the center of the rotating axis	
Control characteristics		
Control algorithm	Hybrid with backtracking	
Control interface	Human-machine interface and remote interface	
External communication interface	ModBus (RS-485, Ethernet, Zigbee, Optical fiber)	
Emergency stow provided	YES	
Stow time	3 minutes and 30 seconds	
Clock accuracy	Maximum deviation of 2 minutes per month, synchronized every day by communications	
Hard limit switches	Limit of angle by overcurrent	
Mechanical design		
Actuation type	Distributed	
Drive type	Electric / self-powered	
Motors	AC 0,18 kW / DC 0,15 kW	
Range of motion, primary axis	-60º to +60º	
Range of motion, secondary axis	N/A	

Characteristic	Data
Manufacturer	NCLAVE MANUFACTURING S.L.U
Model Number	SP160
Type of Tracker	Horizontal single axis tracker
Payload characteristics	
Minimum/maximum mass supported	From 0kg to 3200kg per row
Payload center of mass restrictions	No restrictions, depending on configuration
Maximum payload surface area	222 m2
Nominal payload surface area	222 m2
Maximum dynamic torques allowed while moving	Zenith: 24kN m
Maximum static torques allowed while in stow position	Zenith: 43kN m
Installation Characteristics	
Allowable foundation	Direct ram / micropyle
Foundation tolerance in primary axis	Ramming posts tolerance: Axial: ±3º N-S Lateral: ±1,5º E-W or ±1,25cm between base and upper flange Spin: ±5º Height: ±30mm
Installation effort	910 h/MW
Electrical characteristics	
Control board	P4Q
Includes backup power	NO
Daily energy consumption	35,92 Wh/day
Stow energy consumption	6,64 Wh/day
Input power requirements	230 Vac + PE, 50/60 Hz
Apparent peak power consumption tracking	44,39 VA
Apparent peak power consumption non-tracking	14,47 VA
Apparent peak power consumption stow positioning	92,28 VA
Tracking accuracy	
Wind speed during the tests	< 4 m/s
Weight and area of payload installed during testing	2000 kg and 180 m2
Payload center of mass installed during testing	95 mm from axis rotation
Control characteristics	
Control algorithm	Hybrid with backtracking control
Control interface	HMI and remote control
External communication interface	ModBus (RS-485) and Zigbee
Emergency stow provided	YES. Wind speed >16,67m/s for >5sec, tracker is moved to stow position (0º)
Stow time	6 minutes
Clock accuracy	Maximum deviation of 2 minutes per month, being synchronized every day through communication server
Hard limit switches	Limit of angle by overcurrent
Mechanical design	
Actuation type	Distributed
Drive type	Electric / self-powered
Motors	DC 0,15 kW
Range of motion, primary axis	-55º to +55º
Range of motion, secondary axis	N/A

The sample selected to test was representative of the production. The sample was selected in.	NCLAVE Manufacturing S.L. P.I. La peña Crta. NA 134-km93 31230. Viana. Navarra. SPAIN March 08, 2017
Sample Report Number	11461-1-TM
The inspection of manufacturing process was performed in: On June 28 of 2017	NCLAVE Manufacturing S.L. P.I. La peña Crta. NA 134-km93 31230. Viana. Navarra. SPAIN March 08, 2017
Inspection Report Number:	11461-IF