CERTIFICATE

Certificate number	15974 Rev.0	Replaces	-
Issued	15/10/2018	First edition	15/10/2018
Report number	PKC0003199	Expiry date	14/10/2023
Page	1 of 1	Contract number	PKC0002751

Product Certificate Solar Thermal Products

License holder: **Sunerg Solar S.r.l.**
Via Donino Donini 51 - 06012 Cinquemiglia - Città di Castello (PG), Italy

Brand name: Solex

Production site(s): Sunerg Solar S.r.l.
Via Donino Donini 51 - 06012 Cinquemiglia - Città di Castello (PG), Italy

Product Solar thermal collector

Model(s): TOP20

Kiwa Cermet Italia hereby declares that the product can be considered complying to the testing requirements and is entitled to use the Solar Keymark Label, based upon the following aspects:

Laboratory testing of the solar thermal products, which are performed by an accredited laboratory in accordance to EN ISO/IEC 17025:2005 -see annex-, using the following standards:

- ISO 9806:2013
  Solar Energy – Solar Thermal Collectors – Test Methods

Specific CEN Keymark Scheme Rules for Solar Thermal Products R.31.

Periodic Inspection of the Factory site(s) performed by Kiwa Cermet Italia.

A description of the test results is given in the annex to this certificate.

This certificate is issued in accordance with the Kiwa Cermet Italia regulations.
Publication of the certificate is allowed.
The validity of this certificate is subject to the positive result of periodic surveillance visits.

Chief Operating Officer
Giampiero Belcredi

Kiwa Cermet Italia S.p.A.
Società con socio unico, soggetta all'attività di direzione e coordinamento di Kiwa Italia Holding Srl
Via Cadriano, 23
40057 Granarolo dell'Emilia (BO)
Unità secondaria
Via Treviso 32/34
31020 San Vendemiano (TV)
Tel +39. 0438 411755
Fax +39.0438 22428
E-mail: info@kiwacermet.it
www.kiwa.it
www.kiwacermet.it

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SGQ N° 007A
SGA N° 010D
PRD N° 069B
FSM N° 004I
PRS N° 089C

Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results

Licence Number	15974 Rev.0
Date issued	2018-10-15
Issued by	Kiwa Cermet Italia S.p.A.

Licence holder	Sunerg Solar S.r.l.	Country	
Brand (optional)	Solex	Web	http://www.sunergsolar.com
Street, Number	Via Donino Donini 51	E-mail	info@sunergsolar.com
Postcode, City	06012 Città di Castello (PG)	Tel	+39 0758540018

Collector Type	Flat plate collector, glazed

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m²; Gd = 150 W/m² ϑm - ϑa: 0 K	10 K	30 K	50 K	70 K	64 K
	m²	mm	mm	mm	W	W	W	W	W	W
TOP20	1.96	1,987	984	100	1,484	1,413	1,259	1,090	905	962
Power output per m² gross area					759	723	644	558	463	492

Performance parameters test method	Steady state - outdoor								
Performance parameters (related to AG)	η0,hem	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results	0.759	3.530	0.010						

Incidence angle modifier test method		Steady state - outdoor								
Bi-directional incidence angle modifiers	No									
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$					0.95				
Longitudinal	$K_{\theta L,coll}$					0.95				

Heat transfer medium for testing	Water-Glycole		
Flow rate for testing (per gross area, A_G)	dm/dt	0.019	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	64	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	224	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	10.2	kJ/(Km²)
Maximum operating temperature	$\vartheta_{max\ op}$	185	°C
Maximum operating pressure	$p_{max,op}$	600	kPa

Testing laboratory	ENEA - Centro Ricerche Trisaia	http://www.trisaia.enea.it	
Test report(s)	RP.2018.COL.198.1 RP.2018.COL.198a.1	Dated	09/05/2018 09/05/2018

Comments of testing laboratory

Datasheet version: 5.01, 2016-03-01

ENEA
DTE-STT
Dr. Vincenzo Sabatelli

Annex to Solar Keymark Certificate	Licence Number	15974 Rev.0
Supplementary Information	Issued	2018-10-15

Annual collector output in kWh/collector at mean fluid temperature ϑ_m, based on ISO 9806:2013 test results

Standard Locations	Athens			Davos			Stockholm			Würzburg		
Collector name ϑ_m	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
TOP20	2,393	1,730	1,163	1,826	1,285	836	1,345	894	558	1,461	968	594
Annual output per m² gross area	1,224	885	595	934	657	428	688	457	286	747	495	304
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1714 kWh/m²			1166 kWh/m²			1244 kWh/m²		
Mean annual ambient air temperature	18.5°C			3.2°C			7.5°C			9.0°C		
Collector orientation or tracking mode	South, 25°			South, 30°			South, 45°			South, 35°		

The collector is operated at constant temperature ϑm (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

Additional Information

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	2410	Pa
Maximum tested negative load	2006	Pa
Hail resistance using ice balls (diameter)	2	mm

Energy Labelling Information

	Reference Area, A_{sol} (m²)
TOP20	1.96

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
Collector efficiency (η_{col})	60	%

Remark: Collector efficiency (η_{col}) is defined in CDR (EU) No 811/2013 as collector efficiency of the solar collector at a temperature difference between the solar collector and the surrounding air of 40 K and a global solar irradiance of 1000 W/m², expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
Zero-loss efficiency (η_0)	0.759	--
First-order coefficient (a_1)	3.53	W/(m²K)
Second-order coefficient (a_2)	0.010	W/(m²K²)
Incidence angle modifier IAM (50°)	0.95	--

Remark: The data given in this section are related to collector reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs.

Kiwa Cermet Italia S.p.A. • Via Cadriano, 23
• 40057 Granarolo dell'Emilia (BO) • Italy
Tel: +39 0514593111 • Fax: +39 051763382 • E-Mail: info@kiwacermet.it • www.kiwacermet.it