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Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results		Licence Number	011-7S2745 F
		Date issued	2017-03-15
		Issued by	TÜV Rheinland Energy GmbH

Licence holder	Cirelius LDA	Country	Portugal		
Brand (optional)	Solius	Web	www.cirelius.pt		
Street, Number	Rua Inocencio Osorio L. Gondim. 103	E-mail	info@cirelius.pt		
Postcode, City	4430-930 Avintes (PT)	Tel	+351	227 843 817	

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	90 K
	m²	mm	mm	mm	W	W	W	W	W	W
Solius TopSol XL	2.38	2 064	1 154	68	1 727	1 640	1 453	1 253	1 038	809
Power output per m² gross area					726	689	611	526	436	340

Performance parameters test method	Steady state - indoor		
Performance parameters (related to AG)	η0,hem	a1	a2
Units	-	W/(m²K)	W/(m²K²)
Test results	0.726	3.607	0.008

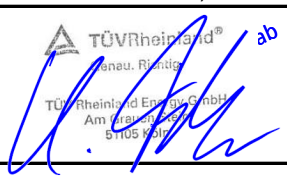
Incidence angle modifier test method	Steady state - outdoor								
Bi-directional incidence angle modifiers	No								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	1.00	0.99	0.97	**0.94**	0.86	0.73	0.47	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.99	0.97	**0.94**	0.86	0.73	0.47	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	90	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	185	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	4.51	kJ/(Km²)
Maximum operating temperature	ϑ_{max_op}	100	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	TÜV Rheinland Energy GmbH	www.tuv.com/solarpower	
Test report(s)	KTB-2010-20 (Fraunhofer ISE; EN 12975-2:2006) 21239489.001 (TÜV Rheinland; EN 12975-1:2006+A1:2010 Doc)	Dated	21.07.2010 14.03.2017

Comments of testing laboratory — Datasheet version: 5.01, 2016-03-01

**This data sheet is not complete as the testing of the collector was not performed according to ISO 9806:2013.* *The steady state test evaluation was recalculated with gross area. The former values related to 2.22 m² aperture area had been: eta0a=0.778; a1a=3.867; a2a=0.0081. TÜV Rheinland Energy GmbH is not responsible for the test reports and the results issued by Fraunhofer ISE.*



Annex to Solar Keymark Certificate	Licence Number	011-7S2745 F
Supplementary Information	Issued	2017-03-15

Annual collector output in kWh/collector at mean fluid temperature ϑ_m, based on EN 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
Solius TopSol XL	2 744	1 947	1 293	2 077	1 446	940	1 527	1 001	623	1 659	1 079	661
Annual output per m² gross area	1 153	818	543	873	608	395	641	421	262	697	454	278
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	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	*	--
Maximum tested positive load	*	Pa
Maximum tested negative load	*	Pa
Hail resistance using steel ball (maximum drop height)	*	m

Energy Labelling Information

	Reference Area, A_{sol} (m^2)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
Solius TopSol XL	2.38	Collector efficiency (η_{col})	57	%
		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)	0.726	--
		First-order coefficient (a_1)	3.61	W/(m²K)
		Second-order coefficient (a_2)	0.008	W/(m²K²)
		Incidence angle modifier IAM (50°)	0.94	--
		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.		