



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S2783 P					
						Date issued		2018-02-26					
						Issued by		TÜV Rheinland Energy GmbH					
Licence holder		SOLAIRE 2G S.A.S				Country		France					
Brand (optional)		DualSun				Web		http://www.dualsun.fr					
Street, Number		2 rue Marc Donadille				E-mail		info@dualsun.fr					
Postcode, City		CS 80001 - 13013 Marseille				Tel		+33 (0)9 52 03 59 57					
Collector Type						Flat plate collector, unglazed							
Collector name	Gross area (A _G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector								
					G _b = 850 W/m ² ; G _d = 150 W/m ² ; u = 1 m/s								
					θ _m - θ _a								
					0 K	10 K	30 K	50 K	70 K	40 K			
					W	W	W	W	W	W			
225M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
230M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
235M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
240M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
245M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
250M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
255M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
260M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
265M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
270M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
275M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
280M - 60 - 2BBPN	1.65	1 677	990	45	822	560	37	0	0	0			
Power output per m ² gross area					497	339	22	0	0	0			
Performance parameters test method		Quasi dynamic											
Performance parameters (related to AG)		η _{0,b}	c ₁	c ₂	c ₃	c ₄	c ₆	K _d					
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-					
Test results		0.570	11.020	0.000	4.802	0.620	0.011	1.000					
Incidence angle modifier test method		Quasi dynamic - outdoor											
Bi-directional incidence angle modifiers		No											
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°		
Transversal		K _{θT, coll}	1.00	0.90	0.90	0.97	0.95	0.90	0.81		0.00		
Longitudinal		K _{θL, coll}	1.00	0.90	0.90	0.97	0.95	0.90	0.81		0.00		
Heat transfer medium for testing		Water											
Flow rate for testing (per gross area, A _G)		dm/dt	0.030	kg/(sm ²)									
Maximum temperature difference for thermal performance calculations		(θ _m -θ _a) _{max}	40	K									
Standard stagnation temperature (G = 1000 W/m ² ; θ _a = 30 °C)		θ _{stg}	70	°C									
Effective thermal capacity, incl. fluid (per gross area, A _G)		C/m ²	42.2	kJ/(Km ²)									
Maximum operating temperature		θ _{max, op}	80	°C									
Maximum operating pressure		p _{max, op}	120	kPa									
Testing laboratory		TÜV Rheinland Energy GmbH				www.tuv.com/solarpower							
Test report(s)		21236476.001r1				Dated		20.01.2017					
Comments of testing laboratory		Datashet version: 5.01, 2016-03-01											
Thermal performance parameters are given for the PV-module working with max. electrical power output ('MPP mode'). As Scenocalc is not operating properly with steady-state test data sets for uncovered/ unglazed collectors, the quasi-dynmiac test results have been used for Scenocalc calculations.						 Genau. Richtig.  TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln							
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2783 P
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on EN ISO 9806:2013 test results

Standard Locations Collector name	ϑ_m	Athens			Davos			Stockholm			Würzburg		
		25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
225M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
230M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
235M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
240M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
245M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
250M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
255M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
260M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
265M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
270M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
275M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	
280M - 60 - 2BBPN		983	20	0	216	0		269	3		329	8	

Annual output per m ² gross area	594	12	0	131	0		163	2		199	5	
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m ²			1714 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²		
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 ϑ_m (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	Yes	
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)	A	--
Maximum tested positive load	5400	Pa
Maximum tested negative load	2400	Pa
Hail resistance using steel ball (maximum drop height)	25	m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
225M - 60 - 2BBPN	1.65	Collector efficiency (η_{col})	0 %
230M - 60 - 2BBPN	1.65	<i>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.</i>	
235M - 60 - 2BBPN	1.65		
240M - 60 - 2BBPN	1.65		
245M - 60 - 2BBPN	1.65		
250M - 60 - 2BBPN	1.65		
255M - 60 - 2BBPN	1.65		
260M - 60 - 2BBPN	1.65		
265M - 60 - 2BBPN	1.65	Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
270M - 60 - 2BBPN	1.65	Zero-loss efficiency (η_0)	0.570 --
275M - 60 - 2BBPN	1.65	First-order coefficient (a_1)	25.43 W/(m ² K)
280M - 60 - 2BBPN	1.65	Second-order coefficient (a_2)	0.000 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.95 --
<i>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.</i>			
Thermal performance parameters are			