



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2782 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					Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² ; u = 1 m/s ∅ _m - ∅ _a									
					0 K	10 K	30 K	50 K	70 K	40 K				
					m ²	mm	mm	mm	W	W	W	W	W	W
225M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
230M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
235M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
240M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
245M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
250M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
255M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
260M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
265M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
270M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
275M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
280M - 60 - 2BBPI					1.65	1 677	990	45	707	556	256	0	0	105
Power output per m ² gross area									428	337	155	0	0	64
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					0.475	7.411	0.000	1.700	0.437	0.003	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	1.00	0.99	0.99	0.98	0.96	0.92		0.00
Longitudinal					K _{θL, coll}	1.00	1.00	0.99	0.99	0.98	0.96	0.92		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					(∅ _m -∅ _a) _{max}		40	K						
Standard stagnation temperature (G = 1000 W/m ² ; ∅ _a = 30 °C)					∅ _{stg}		80	°C						
Effective thermal capacity, incl. fluid (per gross area, A _G)					C/m ²		42.2	kJ/(Km ²)						
Maximum operating temperature					∅ _{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					Datasheet 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-dynmic test results have been used for Scenocalc calculations.					 Genau. Richtig.  TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln									
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on EN ISO 9806:2013 test results

Collector name	Standard Locations 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 - 2BBPI		942	124	2	388	25		350	34		406	47	0
230M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
235M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
240M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
245M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
250M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
255M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
260M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
265M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
270M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
275M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0
280M - 60 - 2BBPI		942	124	2	388	25		350	34		406	47	0

Annual output per m ² gross area	571	75	1	235	15		212	21		246	29	0
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 - 2BBPI	1.65	Collector efficiency (η_{col})	0 %
230M - 60 - 2BBPI	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 - 2BBPI	1.65		
240M - 60 - 2BBPI	1.65		
245M - 60 - 2BBPI	1.65		
250M - 60 - 2BBPI	1.65		
255M - 60 - 2BBPI	1.65		
260M - 60 - 2BBPI	1.65		
265M - 60 - 2BBPI	1.65	Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
270M - 60 - 2BBPI	1.65	Zero-loss efficiency (η_0)	0.475 --
275M - 60 - 2BBPI	1.65	First-order coefficient (a_1)	12.51 W/(m ² K)
280M - 60 - 2BBPI	1.65	Second-order coefficient (a_2)	0.000 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.98 --
<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			