



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

Licence Number	011-7S2757 F
Date issued	2017-05-16
Issued by	Benedict Han

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Collector Type	Flat plate collector, glazed
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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 = 3 m/s ̑ _m - ̑ _a					
					0 K	10 K	30 K	50 K	70 K	76 K
					W	W	W	W	W	W
PL20	2.01	2 005	1 004	80	1 433	1 350	1 153	917	640	549
PL24	2.40	2 000	1 200	80	1 711	1 612	1 377	1 095	764	656
PL30	3.01	2 005	1 501	80	2 146	2 021	1 727	1 373	959	822
Power output per m ² gross area					713	672	574	456	318	273

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	0.721	3.885	0.025	0.000	0.000	0.000	0.925			

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	0.98	0.96	0.92	0.85	0.74	0.50	0.00	0.00
Longitudinal	K _{θL, coll}	1.00	0.98	0.96	0.92	0.85	0.74	0.50	0.00	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A _G)	dm/dt	0.020	kg/(sm ²)
Maximum temperature difference for thermal performance calculations	(̑ _m - ̑ _a) _{max}	76	K
Standard stagnation temperature (G = 1000 W/m ² ; ̑ _a = 30 °C)	̑ _{stg}	163	°C
Effective thermal capacity, incl. fluid (per gross area, A _G)	C/m ²	17.3	kJ/(Km ²)
Maximum operating temperature	̑ _{max, op}	100	°C
Maximum operating pressure	p _{max, op}	1000	kPa

Testing laboratory	TUV Rheinland (Shanghai) Co., Ltd.	www.tuv.com
Test report(s)	154244852_EN_PL20_Report_zhao 154244852_EN_PL30_Report_zhao	Dated 5/4/2017 5/4/2017

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



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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on 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
PL20		2 192	1 416	760	1 591	961	458	1 183	684	327	1 298	739	347
PL24		2 617	1 691	908	1 899	1 147	547	1 413	816	391	1 549	883	415
PL30		3 282	2 121	1 139	2 382	1 439	686	1 772	1 024	490	1 943	1 107	520
Annual output per m ² gross area		1 090	705	378	791	478	228	589	340	163	646	368	173
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	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)	C
Maximum tested positive load	2400 Pa
Maximum tested negative load	2190 Pa
Hail resistance using steel ball (maximum drop height)	2 m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
PL20	2.01	Collector efficiency (η_{col})	52 %
PL24	2.40	<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>	
PL30	3.01		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.713
		First-order coefficient (a_1)	3.89 W/(m ² K)
		Second-order coefficient (a_2)	0.025 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.85
		<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>	