


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2658 F							
					Date issued		2016-08-24							
					Issued by		DIN CERTCO							
Licence holder	AQUASOL Solartechnik GmbH				Country	Deutschland								
Brand (optional)					Web	http://www.aquasol.de								
Street, Number	Dr.-Carl-Schwenk-Str. 20				E-mail	info@aquasol.de								
Postcode, City	89233 Neu-Ulm/Burlafingen				Tel	+49 731 8800700 / 731 88007048								
Collector Type					Flat plate collector, glazed									
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 $\vartheta_m - \vartheta_a$									
					0 K W	10 K W	30 K W	50 K W	70 K W	109 K W				
MAS 2.3	2.34	2 043	1 143	80	1 767	1 671	1 468	1 253	1 025	541				
Power output per m ² gross area					755	714	628	535	438	231				
Performance parameters test method					Quasi dynamic									
Performance parameters (related to A _G)					$\eta_{0,b}$	c1	c2	c3	c4	c6	K _d			
Units					-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results					0.756	4.042	0.007	0.000	0.000	0.000	0.992			
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					$K_{\theta T, coll}$	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	0.00
Longitudinal					$K_{\theta L, coll}$	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	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					$(\vartheta_m - \vartheta_a)_{max}$	109	K							
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ C$)					ϑ_{stg}	177	°C							
Effective thermal capacity, incl. fluid (per gross area, A _G)					C/m ²	11.487	kJ/(Km ²)							
Maximum operating temperature					$\vartheta_{max, op}$	n.a.	°C							
Maximum operating pressure					$p_{max, op}$	1000	kPa							
Testing laboratory					TZS, ITW University Stuttgart			www.itw.uni-stuttgart.de						
Test report(s)					10COL871/10EM10			Dated		02.08.2016				
Comments of testing laboratory					Datashet version: 5.01, 2016-03-01									
No comment					 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)									

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2658 F
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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
MAS 2.3		2 859	1 992	1 293	2 131	1 448	911	1 575	1 008	608	1 725	1 096	650
Annual output per m ² gross area		1 222	851	553	910	619	389	673	431	260	737	468	278
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	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	B	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	2000	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

Energy Labelling Information			
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
MAS 2.3	2.34	Collector efficiency (η_{col})	58 %
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/m ² , 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)	0.755 --
		First-order coefficient (a_1)	4.04 W/(m ² K)
		Second-order coefficient (a_2)	0.007 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.92 --
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.			