

Annex to Solar Keymark Certificate					Licence Number		011-7S1591 F							
					Date issued		2022-01-25							
					Issued by		DIN CERTCO							
Licence holder		AquaTherm GmbH			Country		Germany							
Brand (optional)					Web		www.aquatherm-gmbh.de							
Street, Number		Im Wiesengrund 15			E-mail		info@aquatherm-gmbh.de							
Postcode, City		D- 34253 Lohfelden			Tel		+49 5608 - 9493 0							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	88 K				
					m ²	mm	mm	mm	mm	mm	mm			
AquaTherm-SOL 2.0					2.32	2 037	1 137	80	1 679	1 589	1 396	1 183	953	729
Power output per m² gross area					725	686	603	511	411	315				
Performance parameters test method		Steady state - indoor												
Performance parameters (related to A_G)		η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0.736	3.78	0.010			4 770				0.90			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.00	0.99	0.98	0.96	0.94	0.88	0.78	0.45	0.00			
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.96	0.94	0.88	0.78	0.45	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 during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		58		K					
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)					ϑ_{stg}		200		°C					
Maximum operating temperature					$\vartheta_{max, op}$		100		°C					
Maximum operating pressure					p _{max, op}		1000		kPa					
Testing laboratory		ISFH CalTeC			https://isfh.de/									
Test report(s)		019-22/B			Dated		25.01.2022							
Comments of testing laboratory					Ver. 6.2 (13.01.2022)									
					Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-34880 Emmertal Tel.: 05151/999-100 Fax: 05151/999-500									
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Supplementary Information		Issued		2022-01-25										
Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m														
	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	
AquaTherm-SOL 2.0		2 656	1 840	1 169	1 982	1 336	818	1 466	932	549	1 596	1 004	582	
Gross Thermal Yield per m ² gross area		1 147	794	505	856	577	353	633	402	237	689	434	251	
Annual efficiency, η_a		65%	45%	29%	53%	35%	22%	54%	34%	20%	55%	35%	20%	
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)												
Annual irradiation on collector plane		1765 kWh/m ²			1630 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. 6.2 (13.01.2022). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/														
Additional Information														
Collector heat transfer medium											Water-Glycole			
The collector is deemed to be suitable for roof integration											No			
The collector was tested successfully under the following conditions:														
Climate class (A+, A, B or C)											A		--	
G (W/m ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >		600				
Maximum tested positive load											3030		Pa	
Maximum tested negative load											2800		Pa	
Hail resistance using steel ball (maximum drop height)											2		m	
Additional collector attribute(s)														
Using external power source(s) for normal operation											No		Active or passive measure(s) for self-protection	No
Co-generating thermal and electrical power											No		Façade collector(s)	No
Energy Labelling Information						Additional Informative Technical Data								
		Reference Area, A _{sol} (m ²)				Hydraulic Designation Code				Aperture Area, A _a (m ²)				
AquaTherm-SOL 2.0		2.32				1-VH-12S-A:11.3;16250				2.13				
Data required for CDR (EU) No 811/2013 - Reference Area A _{sol}						Data required for CDR (EU) No 812/2013 - Reference Area A _{sol}								
Collector efficiency (η_{col})		56%				Zero-loss efficiency (η_0)				0.72		--		
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 9806:2017.						First-order coefficient (a ₁)				3.78		W/(m ² K)		
						Second-order coefficient (a ₂)				0.010		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.								
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