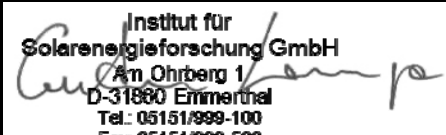


Annex to Solar Keymark Certificate					Licence Number		011-7S2999 F							
					Date issued		2021-01-05							
					Issued by		ISFH CalTeC							
Licence holder		Wagner Solar GmbH			Country		Germany							
Brand (optional)					Web		www.wagner-solar.com							
Street, Number		Sonnenallee 2			E-mail		info@wagner-solar.com							
Postcode, City		D- 35274 Kirchhain			Tel		+49 6421 8007-0							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	88 K				
					m ²	mm	mm	mm	mm	mm	mm			
EURO L20 MQ AR					2.61	2 151	1 215	110	1 948	1 862	1 666	1 442	1 189	937
Power output per m² gross area					746	712	638	552	455	358				
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		0.761	3.18	0.014			6 010				0.87			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{\theta T, coll}$	1.00	0.99	0.98	0.95	0.91	0.84	0.70	0.26	0.00			
Longitudinal		$K_{\theta L, coll}$	1.00	0.99	0.98	0.95	0.91	0.84	0.70	0.26	0.00			
Heat transfer medium for testing		Water-Glycole												
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}		210		°C								
Maximum operating temperature		$\vartheta_{max, op}$		-		°C								
Maximum operating pressure		$p_{max, op}$		1000		kPa								
Testing laboratory		ISFH CalTeC					http://www.isfh.de							
Test report(s)		044-20/K					Dated		18.12.2020					
Comments of testing laboratory		Datasheet version: 6.1, 2019-07-11												
		 <p> Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31860 Emmertal Tel.: 05151/999-100 Fax: 05151/999-500 </p>												
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Annex to Solar Keymark Certificate		Licence Number												
Supplementary Information		011-7S2999 F												
		Issued												
		2021-01-05												
Annual collector output 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	
EURO L20 MQ AR		3 042	2 211	1 472	2 344	1 649	1 058	1 716	1 149	710	1 861	1 237	752	
Annual output per m ² gross area		1 164	846	563	897	631	405	657	440	272	712	473	288	
Annual efficiency, η_a		66%	48%	32%	55%	39%	25%	56%	38%	23%	57%	38%	23%	
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. 6.1 (July 2019). 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											5014		Pa	
Maximum tested negative load											2791		Pa	
Hail resistance using steel ball (maximum drop height)											1.6		m	
Additional collector attribute(s)														
<input type="checkbox"/> Using external power source(s) for normal operation <input type="checkbox"/> Active or passive measure(s) for self-protection <input type="checkbox"/> Co-generating thermal and electrical power <input type="checkbox"/> Façade collector(s)														
Energy Labelling Information							Additional Informative Technical Data							
		Reference Area, A _{sol} (m ²)					Hydraulic Designation Code				Aperture Area, A _a (m ²)			
EURO L20 MQ AR		2.61					1-H-1234S-A:7.2,24550-C:16.6,2160				2.36			
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})		60%					Zero-loss efficiency (η_0)				0.75			--
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)		3.18		W/(m ² K)
										Second-order coefficient (a ₂)		0.014		W/(m ² K ²)
										Incidence angle modifier IAM (50°)		0.90		--
										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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