


Annex to Solar Keymark Certificate						Licence Number		011-7S591 F			
						Date issued		2019-04-18			
						Issued by		TÜV Rheinland Energy GmbH			
Licence holder		Wolf GmbH				Country		Germany			
Brand (optional)						Web		www.wolf-heiztechnik.de			
Street, Number		Postfach 13 80				E-mail		info@wolf-heiztechnik.de			
Postcode, City		84044 Mainburg				Tel		+49 (0) 8751 74-0			
Collector Type						Flat plate collector					
Collector name	Gross height mm	Gross area (A _G) m ²	Gross length mm	Gross width mm	Aperture area (A _a) m ²	Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s θ _m - θ _a					
						0 K W	10 K W	30 K W	50 K W	70 K W	100 K W
CFK-1	110	2.30	2 099	1 099	2.12	1 482	1 405	1 236	1 049	844	502
Power output per m ² gross area						644	611	537	456	367	218
Performance parameters test method		Quasi dynamic									
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		0.652	3.26	0.010	0.000	0.00	9 844	0.000	0.00	0.0E+00	0.92
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	0.97	0.95	0.90	0.82	0.66	0.33	0.00
Longitudinal		K _{θL, coll}	1.00	0.99	0.97	0.95	0.90	0.82	0.66	0.33	0.00
Heat transfer medium for testing						Water					
Flow rate for testing (per gross area, A _G)						dm/dt	0.019	kg/(sm ²)			
Maximum temperature difference during thermal performance test						(θ _m -θ _a) _{max}	70	K			
Standard stagnation temperature (G = 1000 W/m ² ; θ _a = 30 °C)						θ _{stg}	210	°C			
Maximum operating temperature						θ _{max, op}	-	°C			
Maximum operating pressure						p _{max, op}	1000	kPa			
Testing laboratory		TÜV Rheinland Energy GmbH				www.tuv.com\solarenergy					
Test report(s)		21243956.001				Dated		18.04.2019			
Comments of testing laboratory						Datasheet version: 6.0, 2018-10-30					
											
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	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
CFK-1		2 330	1 621	1 029	1 745	1 177	717	1 288	821	484	1 405	887	513
Annual output per m ² gross area		1 013	705	448	759	512	312	560	357	210	611	386	223
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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

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
Maximum tested positive load		3000 Pa	
Maximum tested negative load		2000 Pa	
Hail resistance using ice balls (diameter)		35 mm	
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"/> Wind and/or infrared sensitive collector(s) (WISC)	
<input type="checkbox"/> Façade collector(s)			
Energy Labelling Information			
	Reference Area, A_{sol} (m ²)	Hydraulic Designation Code	
CFK-1	2.30	9-VH-1234S-7.2,1891-16.4,1079	
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})	50%	Zero-loss efficiency (η_0)	0.64
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)	3.26 W/(m ² K)
		Second-order coefficient (a_2)	0.010 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.91
		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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