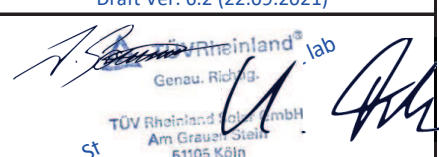


Annex to Solar Keymark Certificate					Licence Number		011-7S1913 F				
					Date issued		2023-07-04				
					Issued by		DINCertco				
Licence holder		STI - Solar Technologie International GmbH			Country		Germany				
Brand (optional)		-			Web		www.sti-solar.de				
Street, Number		Seiferitzer Allee 14			E-mail		info@sti-solar.de				
Postcode, City		08393 Meerane			Tel		+49 3763 7956 10				
Collector Type					Flat plate collector						
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 = 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	
FKF 200 V Al/Al	2.10	1 746	1 200	85	1 411	1 337	1 171	982	769	406	
FKF 240 V Al/Al	2.52	2 100	1 200	85	1 693	1 604	1 405	1 178	923	488	
FKF 270 V Al/Al	2.85	2 373	1 200	85	1 915	1 814	1 589	1 333	1 044	551	
FKF 200 H Al/Al	2.10	1 200	1 746	85	1 411	1 337	1 171	982	769	406	
FKF 240 H Al/Al	2.52	1 200	2 100	85	1 693	1 604	1 405	1 178	923	488	
FKF 270 H Al/Al	2.85	1 200	2 373	85	1 915	1 814	1 589	1 333	1 044	551	
Power output per m ² gross area					672	637	558	468	366	193	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to A _G)		η _{0, b}	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	a ₇	a ₈	K _d
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		0.682	3.38	0.014	0.000	0.00	6 042	0.000	0.00	0.0E+00	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	0.97	0.95	0.91	0.83	0.68	0.34	0.00
Longitudinal		K _{θL, coll}	1.00	0.99	0.97	0.95	0.91	0.83	0.68	0.34	0.00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A _G)					dm/dt	0.024	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}	200	°C				
Maximum operating temperature					θ _{max, op}	120	°C				
Maximum operating pressure					p _{max, op}	600	kPa				
Testing laboratory		TÜV Rheinland Solar GmbH			www.tuv.com/solar						
Test report(s)		DE23SF4L 001 DE23NEYH 001			Dated		04.07.2023 04.07.2023				
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)						
											
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Annex to Solar Keymark Certificate		Licence Number		011-7S1913 F										
Supplementary Information		Issued		2023-07-04										
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	
FKF 200 V Al/Al		2 203	1 516	931	1 645	1 087	632	1 216	762	430	1 325	822	456	
FKF 240 V Al/Al		2 644	1 820	1 118	1 974	1 305	758	1 459	914	516	1 590	986	547	
FKF 270 V Al/Al		2 990	2 058	1 264	2 232	1 476	858	1 650	1 034	584	1 798	1 115	618	
FKF 200 H Al/Al		2 203	1 516	931	1 645	1 087	632	1 216	762	430	1 325	822	456	
FKF 240 H Al/Al		2 644	1 820	1 118	1 974	1 305	758	1 459	914	516	1 590	986	547	
FKF 270 H Al/Al		2 990	2 058	1 264	2 232	1 476	858	1 650	1 034	584	1 798	1 115	618	
Gross Thermal Yield per m ² gross area		1 049	722	444	783	518	301	579	363	205	631	391	217	
Annual efficiency, η_a		59%	41%	25%	48%	32%	18%	50%	31%	18%	51%	31%	17%	
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 Draft Ver. 6.2 (22.09.2021). 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										Yes				
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										3000		Pa		
Maximum tested negative load										2000		Pa		
Hail resistance using ice balls (diameter)										35		mm		
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)			
FKF 200 V Al/Al						2.10		1-H-1234S-A:8.6,17680-C:20.0,1169			1.83			
FKF 240 V Al/Al						2.52		1-H-1234S-A:8.6,22100-C:20.0,1169			2.33			
FKF 270 V Al/Al						2.85		1-H-1234S-A:8.6,25415-C:20.0,1169			2.52			
FKF 200 H Al/Al						2.10		1-H-1234S-A:8.6,16500-C:20.0,1715			1.80			
FKF 240 H Al/Al						2.52		1-H-1234S-A:8.6,20070-C:20.0,2069			2.33			
FKF 270 H Al/Al						2.85		1-H-1234S-A:8.6,22770-C:20.0,2342			2.52			
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})						51%		Zero-loss efficiency (η_0)			0.67		--	
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)			3.38			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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