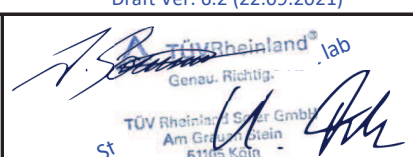


Annex to Solar Keymark Certificate					Licence Number		011-7S3200 F							
					Date issued		2023-08-25							
					Issued by		DINCertco							
Licence holder		STI - Solar Technologie International GmbH			Country		Germany							
Brand (optional)		-			Web		www.sti-solar.de							
Street, Number		Seiferitzer Allee 14			E-mail		info@sti-solar.de							
Postcode, City		08393 Meerane			Tel		+49 3763 7956 10							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					Gross area (A _G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	100 K
					m ²	mm	mm	mm	W	W	W	W	W	W
FKF 90 V Al/Cu					1.00	1 220	820	85	683	641	549	444	325	124
FKF 90 H Al/Cu					1.00	820	1 220	85	683	641	549	444	325	124
FKF 90 V Al/Al					1.00	1 220	820	85	683	641	549	444	325	124
FKF 90 H Al/Al					1.00	820	1 220	85	683	641	549	444	325	124
Power output per m ² gross area					683	641	549	444	325	124				
Performance parameters test method		Steady state - outdoor												
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		0.689	3.99	0.016	0.000	0.00	8 381	0.000	0.00	0.0E+00	0.94			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{GT, coll}	1.00	0.99	0.97	0.95	0.91	0.83	0.68	0.34	0.00			
Longitudinal		K _{GL, 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	0.035	kg/(sm ²)							
Maximum temperature difference during thermal performance test					($\vartheta_m - \vartheta_a$) _{max}	70	K							
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30$ °C)					ϑ_{stg}	190	°C							
Maximum operating temperature					$\vartheta_{max, op}$	120	°C							
Maximum operating pressure					p _{max, op}	600	kPa							
Testing laboratory		TÜV Rheinland Solar GmbH			www.tuv.com/solar									
Test report(s)		DE23EVEH 002 DE23NEYH 001 DE23132A 002			Dated		25.08.2023 04.07.2023 25.08.2023							
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
														
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Annex to Solar Keymark Certificate							Licence Number		011-7S3200 F						
Supplementary Information							Issued		2023-08-25						
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		
FKF 90 V Al/Cu		1 073	698	393	776	480	249	579	339	173	634	366	183		
FKF 90 H Al/Cu		1 073	698	393	776	480	249	579	339	173	634	366	183		
FKF 90 V Al/Al		1 073	698	393	776	480	249	579	339	173	634	366	183		
FKF 90 H Al/Al		1 073	698	393	776	480	249	579	339	173	634	366	183		
Gross Thermal Yield per m ² gross area		1 073	698	393	776	480	249	579	339	173	634	366	183		
Annual efficiency, η_a		61%	40%	22%	48%	29%	15%	50%	29%	15%	51%	29%	15%		
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 90 V Al/Cu						1.00		1-H-1234S-A:9.0,8360-C:20.4,826			0.88				
FKF 90 H Al/Cu						1.00		1-H-1234S-A:9.0,6960-C:20.4,1226			0.88				
FKF 90 V Al/Al						1.00		1-H-1234S-A:8.6,8360-C:20.0,826			0.88				
FKF 90 H Al/Al						1.00		1-H-1234S-A:8.6,6960-C:20.0,1226			0.88				
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)			0.68			--	
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)			3.99			W/(m ² K)			
						Second-order coefficient (a_2)			0.016			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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