


Annex to Solar Keymark Certificate					Licence Number		011-7S1854 F							
					Date issued		2022-03-09							
					Issued by		DIN CERTCO							
Licence holder			TWL-Technologie GmbH		Country		Germany							
Brand (optional)					Web		www.twl-technologie.de							
Street, Number			Im Gewerbegebiet 2-12		E-mail		vertrieb@twl-technologie.de							
Postcode, City			92271 Freihung		Tel/Fax		+49 (0)4351 - 751700 / -751701							
Collector Type					Flat plate collector									
Collector name					Gross area ( $A_G$ ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector					
									Gb = 850 W/m <sup>2</sup> , Gd = 150 W/m <sup>2</sup> & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
									0 K	10 K	30 K	50 K	70 K	118 K
									W	W	W	W	W	W
FK200					2.34	2 000	1 170	85	1 710	1 615	1 409	1 182	935	258
Power output per m <sup>2</sup> gross area									731	690	602	505	400	110
Performance parameters test method			Quasi dynamic											
Performance parameters (related to $A_G$ )			$\eta_{0, b}$	a1	a2	a3	a4	a5	a6	a7	a8	Kd		
Units			-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-		
Test results			0.734	3.96	0.011	0.000	0.00	11 450	0.000	0.00	0.0E+00	0.97		
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	1.00	0.99	0.98	0.96	0.89	0.71	0.36	0.00		
Longitudinal			$K_{\theta L, coll}$	1.00	1.00	0.99	0.98	0.96	0.89	0.71	0.36	0.00		
Heat transfer medium for testing			Water											
Flow rate for testing (per gross area, $A_G$ )			dm/dt	0.020	kg/(sm <sup>2</sup> )									
Maximum temperature difference during thermal performance test			$(\vartheta_m - \vartheta_a)_{max}$	88	K									
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30 \text{ °C}$ )			$\vartheta_{stg}$	200	°C									
Maximum operating temperature			$\vartheta_{max, op}$	-	°C									
Maximum operating pressure			$p_{max, op}$	1000	kPa									
Testing laboratory			Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)					http://www.igte.uni-stuttgart.de						
Test report(s)			20COL1537/1OEM05 20COL1538Q/2OEM05					Dated		28.02.2022 28.02.2022				
Comments of testing laboratory			Ver. 6.2 (13.01.2022)											
According to the Solar Keymark Scheme rules the collector was retested after 10 years after the previous test. This data sheet replaces the data sheet issued on 14.02.2017 by Fraunhofer ISE.														
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Supplementary Information				Issued		2022-03-09							
<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
		$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C
FK200		2 776	1 909	1 193	2 063	1 372	820	1 524	957	551	1 668	1 038	588
Gross Thermal Yield per m <sup>2</sup> gross area		1 186	816	510	881	587	350	651	409	235	713	444	251
Annual efficiency, $\eta_a$		67%	46%	29%	54%	36%	21%	56%	35%	20%	57%	36%	20%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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 $\vartheta_m$ (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 <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>													
<b>Additional Information</b>													
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 <sup>2</sup> ) >		1000		$\vartheta_a$ (°C) >		20		H <sub>x</sub> (MJ/m <sup>2</sup> ) >		3000		600	
Maximum tested positive load										3000		Pa	
Maximum tested negative load										2500		Pa	
Hail resistance using steel ball (maximum drop height)										2		m	
<b>Additional collector attribute(s)</b>													
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			
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>							
		Reference Area, A <sub>sol</sub> (m <sup>2</sup> )		Hydraulic Designation Code				Aperture Area, A <sub>a</sub> (m <sup>2</sup> )					
FK200		2.34		12-V-1234S-7.2,1838-20.4,1215-D				2.22					
<b>Data required for CDR (EU) No 811/2013 - Reference Area A<sub>sol</sub></b>						<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>							
Collector efficiency ( $\eta_{col}$ )		55%				Zero-loss efficiency ( $\eta_0$ )		0.73		--			
Remark: Collector efficiency ( $\eta_{col}$ ) 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 <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area (A <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient (a <sub>1</sub> )		3.96		Second-order coefficient (a <sub>2</sub> )		0.011		W/(m <sup>2</sup> K)			
		Incidence angle modifier IAM (50°)		0.96		--							
								Remark: The data given in this section are related to collector reference area (A <sub>sol</sub> ) 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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