


Annex to Solar Keymark Certificate					Licence Number		011-7S2243 F																	
					Date issued		2021-01-08																	
					Issued by		TÜV Rheinland Energy																	
Licence holder		Bosch Thermotechnik GmbH			Country		Germany																	
Brand (optional)		Bosch			Web		www.bosch-thermotechnik.de																	
Street, Number		Junkersstrasse 20-24			E-mail		solarthermie@de.bosch.com																	
Postcode, City		73249 Wernau			Tel		49 (0)2557 9399-0 / -																	
Collector Type					Flat plate collector																			
Collector name					Gross area (A_G)		Gross length		Gross width		Gross height		Power output per collector											
					m ²		mm		mm		mm		G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$											
					0 K		10 K		30 K		50 K		70 K		115 K									
					W		W		W		W		W		W									
Bosch FK-2S					2.37		2 017		1 175		87		1 706		1 619		1 428		1 212		972		340	
Junkers FK-2S					2.37		2 017		1 175		87		1 706		1 619		1 428		1 212		972		340	
Worcester Worcester Solar-Lifestyle portrait					2.37		2 017		1 175		87		1 706		1 619		1 428		1 212		972		340	
Power output per m² gross area					720		683		603		511		410		144									
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 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					0.725	3.52	0.013	0.000	0.00	9 995	0.000	0.00	0.0E+00	0.95										
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	0.97	0.95	0.91	0.83	0.68	0.34	0.00										
Longitudinal					$K_{\theta L, coll}$	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		0.022		kg/(sm ²)															
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		85		K															
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ °C}$)					ϑ_{stg}		210		°C															
Maximum operating temperature					$\vartheta_{max, op}$		n.n.		°C															
Maximum operating pressure					$p_{max, op}$		600		kPa															
Testing laboratory					TÜV Rheinland Energy GmbH			www.tuv.com/solar																
Test report(s)					21249284.001			Dated		24.08.2020														
Comments of testing laboratory					Datasheet version: 6.1, 2019-07-11																			
					 TÜVRheinland® Genau. Richtig. TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln																			
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Supplementary Information							Issued		2021-01-08				
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
Bosch FKC-2S		2 714	1 906	1 212	2 041	1 380	836	1 507	966	566	1 646	1 047	603
Junkers FKC-2S		2 714	1 906	1 212	2 041	1 380	836	1 507	966	566	1 646	1 047	603
Worcester Worcester Solar-Lifestyle portrait		2 714	1 906	1 212	2 041	1 380	836	1 507	966	566	1 646	1 047	603
Annual output per m ² gross area		1 145	804	511	861	582	353	636	408	239	694	442	254
Annual efficiency, η_a		65%	46%	29%	53%	36%	22%	55%	35%	20%	56%	36%	20%
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							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							5400			Pa			
Maximum tested negative load							4000			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"/> 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)						
Bosch FKC-2S	2.37		11-V-1234S-A:5.2,1865-C:16.6,1129				2.25						
Junkers FKC-2S	2.37		11-V-1234S-A:5.2,1865-C:16.6,1129				2.25						
Worcester Worcester Solar-Lifestyle portrait	2.37		11-V-1234S-A:5.2,1865-C:16.6,1129				2.25						
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})		56%				Zero-loss efficiency (η_0)		0.72		--			
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)		3.52		W/(m ² K)			
						Second-order coefficient (a ₂)		0.013		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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