


Annex to Solar Keymark Certificate					Licence Number		011-7S323 F								
					Date issued		2022-02-28								
					Issued by		DIN CERTCO								
Licence holder		KOLLECTOR BIOME BEJA - K.B.B. SA			Country		Tunesia								
Brand (optional)					Web		www.biome-solar.com								
Street, Number		Zone Industrielle - Beja Nord			E-mail		mohamed.zarrouk@solar-kbb.com								
Postcode, City		9000 Béja			Tel		+216 78 440 440								
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						
									Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$						
Power output per m² gross area															
					717	682	603	515	415	217					
Performance parameters test method		Steady state - outdoor													
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		0.717	3.40	0.013	0.000	0.00	9856	0.000	0.00	0.0	1.00				
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	0.98	0.96	0.94	0.71	0.47	0.24	0.00				
Longitudinal		$K_{\theta L, coll}$	1.00	0.99	0.98	0.96	0.94	0.71	0.47	0.24	0.00				
Heat transfer medium for testing		Water-Glycole													
Flow rate for testing (per gross area, A_G)		dm/dt		0.020		kg/(sm ²)									
Maximum temperature difference during thermal performance test		$(\vartheta_m - \vartheta_a)_{max}$		75		K									
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)		ϑ_{stg}		210		°C									
Maximum operating temperature		$\vartheta_{max, op}$		120		°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)		17COL1420/1; 17COL1421/1 17COL1421Q/1 98-08/KD issued by ISFH					Dated		09.02.2022 / 09.02.2022 09.02.2022 13.11.2008						
Comments of testing laboratory		Ver. 6.2 (13.01.2022)													
<p>This data sheet replaces the data sheet issued on 3.7.2019</p> <p>Documented performance parameters are taken from 98-08/KD issued by ISFH</p> <p>The company details were updated.</p>		 <p>Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 8, 70560 Stuttgart (Vaihingen)</p>													
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Supplementary Information		Issued		2022-02-28									
Gross Thermal Yield 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
K420-DH		2 499	1 776	1 148	1 896	1 298	803	1 390	903	541	1 523	984	578
K423-DH		2 890	2 054	1 327	2 193	1 502	929	1 608	1 045	626	1 762	1 138	668
K420-VH		2 499	1 776	1 148	1 896	1 298	803	1 390	903	541	1 523	984	578
K423-VH		2 890	2 054	1 327	2 193	1 502	929	1 608	1 045	626	1 762	1 138	668
Gross Thermal Yield per m ² gross area		1 151	818	529	874	598	370	641	416	249	702	453	266
Annual efficiency, η_a		65%	46%	30%	54%	37%	23%	55%	36%	21%	56%	36%	21%
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. 6.2 (13.01.2022). 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										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		H_x (MJ/m ²) >		600			
Maximum tested positive load										3000		Pa	
Maximum tested negative load										2500		Pa	
Hail resistance using steel ball (maximum drop height)										1.2		m	
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)						
K420-DH		2.17		10-V-23S-A:7.3,1762-C:16.4,1135- D			2.00						
K423-DH		2.51		10-V-23S-A:7.3,2052-C:16.4,1135- D			2.32						
K420-VH		2.17		10-V-12V-A:7.3,1752-C:16.4,1554- D			2.00						
K423-VH		2.51		10-V-12V-A:7.3,2042-C:16.4,1154- D			2.32						
Data required for CDR (EU) No 811/2013 - Reference Area						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)		3.40		Second-order coefficient (a_2)		0.013		W/(m ² K)			
		Incidence angle modifier IAM (50°)		0.93						W/(m ² K ²)			
										--			
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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