


Annex to Solar Keymark Certificate					Licence Number		011-7S2460 R							
					Date issued		2020-10-12							
					Issued by		TÜV Rheinland Energy GmbH							
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					Evacuated tubular collector									
Collector name					Power output per collector									
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s ϑ _m - ϑ _a									
					0 K	10 K	30 K	50 K	70 K	90 K				
					m ²	mm	mm	mm	mm	mm	mm			
Bosch VK120-2 CPC (2 Modules)					2.44	1 947	1 248	87	1 445	1 422	1 369	1 305	1 232	1 150
Power output per m² gross area					592	583	561	535	505	471				
Performance parameters test method		Quasi dynamic												
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		0.595	0.90	0.005	0.000	0.00	18 836	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 _{θT, coll}	1.00	0.99	1.01	1.00	1.00	1.01	1.00	1.00	0.00			
Longitudinal		K _{θL, coll}	1.00	0.98	0.95	0.90	0.83	0.72	0.56	0.33	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt	0.020	kg/(sm ²)							
Maximum temperature difference during thermal performance test					(ϑ _m -ϑ _a) _{max}	60	K							
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)					ϑ _{stg}	310	°C							
Maximum operating temperature					ϑ _{max, op}	-	°C							
Maximum operating pressure					p _{max, op}	1000	kPa							
Testing laboratory		TÜV Rheinland Energy GmbH			www.tuv.com/solarenergy									
Test report(s)		21249958.001			Dated		15.09.2020							
Comments of testing laboratory					Datasheet version: 6.1, 2019-07-11									
Because of product size 2 samples were combined for testing incl. additional CPC-element. Dimension of single element (l/w/h) [mm]: 1947 / 624 / 87 Areas of single element (Aa/Ag) [m ²]: 0.98 / 1.22 Due to the design that used single elements to enlarge final collector field area; combined with additional CPC-elements; the enclosed maximum power peak-values had been documented in test report.					 TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln									
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Supplementary Information		011-7S2460 R												
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		2020-10-12												
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 VK120-2 CPC (2 Modules)		2 449	2 191	1 905	2 100	1 837	1 565	1 526	1 307	1 089	1 638	1 405	1 172	
Annual output per m ² gross area		1 004	898	781	861	753	642	625	536	446	671	576	480	
Annual efficiency, η_a		57%	51%	44%	53%	46%	39%	54%	46%	38%	54%	46%	39%	
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											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											2700		Pa	
Maximum tested negative load											2250		Pa	
Hail resistance using ice balls (diameter)											25		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 VK120-2 CPC (2 Modules)						2.44		1-V-1122S-A:6,21660-C:15.8,625			2.06			
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})						55%		Zero-loss efficiency (η_0)			0.59		--	
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)			0.90		W/(m ² K)			
						Second-order coefficient (a_2)			0.005		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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