


Annex to Solar Keymark Certificate						Licence Number		011-7S823 F			
						Date issued		2019-06-21			
						Issued by					
Licence holder		CHROMAGEN				Country		ISRAEL			
Brand (optional)		--				Web		http://www.chromagen.com			
Street, Number		Kibbutz Sha'ar Ha'amakim				E-mail		yair@chromagen.com			
Postcode, City		3658800				Tel		+972 4-953-8888/8897			
Collector Type						Flat plate collector					
Collector name	Gross height mm	Gross area (A _G) m ²	Gross length mm	Gross width mm	Aperture area (A _a) m ²	Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
						0 K W	10 K W	30 K W	50 K W	70 K W	80 K W
QR-K / QA-K	90	1,66	1.815	915	1,51	1.074	1.008	868	719	561	478
QR-D / QA-D	90	2,02	1.891	1.071	1,87	1.307	1.226	1.056	875	682	582
QR-E / QA-E	90	2,33	2.180	1.071	2,16	1.508	1.415	1.218	1.009	787	671
QR-F / QA-F	90	2,77	2.182	1.271	2,58	1.793	1.682	1.448	1.200	935	798
Power output per m ² gross area						647	607	523	433	338	288
Performance parameters test method		Steady state - indoor									
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		0,653	3,93	0,007	0,000	0,00	0	0,000	0,00	0,0E+00	0,94
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K _{gT, coll}	1,00	0,99	0,98	0,96	0,94	0,88	0,78	0,45	0,00
Longitudinal		K _{gL, coll}	1,00	0,99	0,98	0,96	0,94	0,88	0,78	0,45	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						($\vartheta_m - \vartheta_a$) _{max}	50	K			
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ\text{C}$)						ϑ_{stg}	165,1	°C			
Maximum operating temperature						$\vartheta_{max, op}$	210	°C			
Maximum operating pressure						P _{max, op}	1000	kPa			
Testing laboratory		Fundación CENER - CIEMAT, LEST				http://www.cener.com					
Test report(s)		30.3300.0-005 R 30.3300.0-006 / 30.3300.0-007 R 30.3300.2 R				Dated		13/06/2019 25/06/2019			
Comments of testing laboratory						Datasheet version: 6.0, 2018-10-30					
- The only difference between the QA and QR collectors is the raw material of the frame. - The collectors models QR-K and QR-F were tested according to ISO 9806:2017. According to SKM rules, the results of the collector model QR-F are representative for the whole QA-QR family.											
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Supplementary Information		Issued		2019-06-21									
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
QR-K / QA-K		1.710	1.129	678	1.239	796	458	923	557	309	1.010	601	328
QR-D / QA-D		2.081	1.374	826	1.508	968	558	1.124	678	376	1.229	731	399
QR-E / QA-E		2.400	1.585	952	1.739	1.117	643	1.296	782	434	1.418	844	461
QR-F / QA-F		2.853	1.884	1.132	2.068	1.328	765	1.541	929	516	1.686	1.003	548
Annual output per m ² gross area		1.030	680	409	747	479	276	556	335	186	609	362	198
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													
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										2400		Pa	
Maximum tested negative load										1500		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"/> Wind and/or infrared sensitive collector(s) (WISC)									
<input type="checkbox"/> Façade collector(s)													
Energy Labelling Information													
	Reference Area, A_{sol} (m ²)			Hydraulic Designation Code									
QR-K / QA-K	1,66			6-V-1234S-A:7,1703-C:20,980-D									
QR-D / QA-D	2,02			7-V-1234S-A:7,1788-C:20,1144-D									
QR-E / QA-E	2,33			7-V-1234S-A:7,2068-C:20,1144-D									
QR-F / QA-F	2,77			8-V-1234S-A:7,2072-C:20,1342-D									
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}													
Collector efficiency (η_{col})		48%											
Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}													
Zero-loss efficiency (η_0)		0,65		--									
First-order coefficient (a_1)		3,93		W/(m ² K)									
Second-order coefficient (a_2)		0,007		W/(m ² K ²)									
Incidence angle modifier IAM (50°)		0,92		--									
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.													
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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