

Annex to Solar Keymark Certificate						Licence Number		011-7S2938 F					
						Date issued		2019-06-25					
						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	81 K W		
QR-SK	90	1,66	1.815	915	1,51	1.133	1.069	926	766	589	485		
QR-SD	90	2,02	1.891	1.071	1,87	1.379	1.300	1.127	933	717	590		
QR-SE	90	2,33	2.180	1.071	2,16	1.591	1.500	1.300	1.076	827	680		
QR-SF	90	2,77	2.182	1.271	2,57	1.891	1.783	1.545	1.279	984	809		
Power output per m ² gross area						683	644	558	462	355	292		
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)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-		
Test results		0,689	3,77	0,013	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 _{θT, coll}	1,00	0,99	0,98	0,96	0,93	0,87	0,75	0,39	0,00		
Longitudinal		K _{θL, coll}	1,00	0,99	0,98	0,96	0,93	0,87	0,75	0,39	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}	51		K								
Standard stagnation temperature (G = 1000 W/m ² ; ϑ_a = 30 °C)		ϑ_{stg}	190,5		°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)		30.3300.0-008 R 30.3300.0-009 / 30.3300.0-010 R 30.3300.3 R					Dated		13/06/2019 25/06/2019				
Comments of testing laboratory		The collectors models QR-SK and QR-SF were tested according to ISO9806:2017. According to SKM rules, the results of the collector model QR-SF are representative for the whole QR family.					Datasheet version: 6.0, 2018-10-30						
							 CENER						
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de													



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Supplementary Information							Issued		2019-06-25				
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-SK		1.805	1.215	728	1.327	857	483	985	602	329	1.077	651	350
QR-SD		2.196	1.478	886	1.614	1.043	588	1.199	732	401	1.311	792	426
QR-SE		2.533	1.705	1.021	1.862	1.203	678	1.383	845	462	1.512	913	492
QR-SF		3.012	2.027	1.214	2.214	1.430	806	1.644	1.004	550	1.797	1.086	584
Annual output per m ² gross area		1.087	732	438	799	516	291	594	363	198	649	392	211
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)													
☐ Using external power source(s) for normal operation							☐ Active or passive measure(s) for self-protection						
☐ Co-generating thermal and electrical power							☐ Wind and/or infrared sensitive collector(s) (WISC)						
☐ Façade collector(s)													
Energy Labelling Information													
	Reference Area, A _{sol} (m ²)			Hydraulic Designation Code									
QR-SK	1,66			8-V-1234S-A:7,1703-C:20,980-D									
QR-SD	2,02			10-V-1234S-A:7,1788-C:20,1144-D									
QR-SE	2,33			10-V-1234S-A:7,2068-C:20,1144-D									
QR-SF	2,77			12-V-1234S-A:7,2072-C:20,1342-D									
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})							51%						
Zero-loss efficiency (η_0)							0,68						
First-order coefficient (a_1)							3,77						
Second-order coefficient (a_2)							0,013						
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/m², 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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