


Annex to Solar Keymark Certificate						Licence Number		011-7S821 F									
						Date issued		2019-06-20									
						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						Power output per collector											
						Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$											
						0 K	10 K	30 K	50 K	70 K	81 K						
						mm	m ²	mm	mm	mm	m ²	W	W	W	W	W	W
PR-K / PA-K						90	1,66	1.815	915	1,51	1.135	1.077	954	822	681	599	
PA-D / PR-D						90	2,02	1.891	1.071	1,87	1.381	1.311	1.161	1.000	828	729	
PA-H						90	2,02	1.071	1.891	1,87	1.381	1.311	1.161	1.000	828	729	
PA-E / PR-E						90	2,33	2.180	1.071	2,16	1.593	1.512	1.339	1.154	955	841	
PA-I						90	2,33	1.071	2.180	2,16	1.593	1.512	1.339	1.154	955	841	
PA-G						90	2,76	1.267	2.180	2,58	1.887	1.791	1.587	1.367	1.132	996	
PA-F / PR-F						90	2,77	2.182	1.271	2,58	1.894	1.797	1.592	1.372	1.136	999	
Power output per m ² gross area						684	649	575	495	410	361						
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		0,691	3,42	0,007	0,000	0,00	0	0,000	0,00	0,0E+00	0,93						
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	0,37	0,00						
Longitudinal		K _{θL, coll}	1,00	0,99	0,98	0,96	0,93	0,87	0,75	0,37	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 ; $\vartheta_a = 30^\circ\text{C}$)		ϑ_{stg}	222,8	°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)		30.3300.0-001 R 30.3300.0-002 / 30.3300.0-003 R 30.3300.0 R				Dated		13/06/2019 25/06/2019									
Comments of testing laboratory		- The only difference between the PA and PR collectors is the raw material of the frame. - The collectors models PR-K and PR-F were tested according to ISO 9806:2017. According to SKM rules, the results of the collector model PR-F are representative for the whole PA-PR family.															
		 Datasheet version: 6.0 / 2018-10-30															
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Supplementary Information							Issued			2019-06-20					
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		
PR-K / PA-K		1.811	1.284	850	1.366	947	611	1.007	658	407	1.097	712	433		
PA-D / PR-D		2.204	1.562	1.035	1.663	1.153	744	1.225	801	495	1.335	867	527		
PA-H		2.204	1.562	1.035	1.663	1.153	744	1.225	801	495	1.335	867	527		
PA-E / PR-E		2.542	1.802	1.193	1.918	1.330	858	1.413	924	571	1.540	1.000	608		
PA-I		2.542	1.802	1.193	1.918	1.330	858	1.413	924	571	1.540	1.000	608		
PA-G		3.012	2.134	1.414	2.272	1.575	1.016	1.674	1.095	677	1.824	1.184	720		
PA-F / PR-F		3.022	2.142	1.419	2.280	1.581	1.020	1.680	1.099	679	1.831	1.188	723		
Annual output per m ² gross area		1.091	773	512	823	571	368	606	397	245	661	429	261		
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										
PR-K / PA-K	1,66				6-V-1234S-A:7,1703-C:20,980-D										
PA-D / PR-D	2,02				7-V-1234S-A:7,1788-C:20,1144-D										
PA-H	2,02				12-H-1234S-A:7,958-C:20,1970-D										
PA-E / PR-E	2,33				7-V-1234S-A:7,2068-C:20,1144-D										
PA-I	2,33				15-H-1234S-A:7,958-C:20,2256-D										
PA-G	2,76				15-H-1234S-A:7,1154-C:20,2256-D										
PA-F / PR-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}							Data required for CDR (EU) No 812/2013 - Reference Area A _{sol}								
Collector efficiency (η_{col})							54%			Zero-loss efficiency (η_0)		0,68		--	
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)		3,42		W/(m ² K)				
							Second-order coefficient (a ₂)		0,007		W/(m ² K ²)				
							Incidence angle modifier IAM (50°)		0,92		--				
							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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