


Annex to Solar Keymark Certificate						Licence Number		<b>011-7S2318 F</b>									
						Date issued		<b>2019-06-25</b>									
						Issued by											
Licence holder		<b>CHROMAGEN</b>				Country		<b>ISRAEL</b>									
Brand (optional)		--				Web		<a href="http://www.chromagen.com">http://www.chromagen.com</a>									
Street, Number		<b>Kibbutz Sha'ar Ha'amakim</b>				E-mail		<b>yair@chromagen.com</b>									
Postcode, City		<b>3658800</b>				Tel		<b>+972 4-953-8888/8897</b>									
Collector Type						<b>Flat plate collector</b>											
Collector name						Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> , G <sub>d</sub> = 150 W/m <sup>2</sup> & u = 1.3 m/s $\vartheta_m - \vartheta_a$											
						0 K	10 K	30 K	50 K	70 K	89 K						
						mm	m <sup>2</sup>	mm	mm	mm	m <sup>2</sup>	W	W	W	W	W	W
<b>PA-SK</b>						<b>90</b>	<b>1,65</b>	<b>1.812</b>	<b>910</b>	<b>1,51</b>	<b>1.209</b>	<b>1.151</b>	<b>1.024</b>	<b>882</b>	<b>726</b>	<b>564</b>	
<b>PA-SD</b>						<b>90</b>	<b>2,02</b>	<b>1.891</b>	<b>1.071</b>	<b>1,87</b>	<b>1.481</b>	<b>1.409</b>	<b>1.254</b>	<b>1.080</b>	<b>889</b>	<b>691</b>	
<b>PA-SE</b>						<b>90</b>	<b>2,33</b>	<b>2.180</b>	<b>1.071</b>	<b>2,16</b>	<b>1.708</b>	<b>1.626</b>	<b>1.446</b>	<b>1.246</b>	<b>1.026</b>	<b>797</b>	
<b>PA-SF</b>						<b>90</b>	<b>2,76</b>	<b>2.180</b>	<b>1.267</b>	<b>2,58</b>	<b>2.023</b>	<b>1.926</b>	<b>1.713</b>	<b>1.476</b>	<b>1.215</b>	<b>944</b>	
Power output per m <sup>2</sup> gross area						<b>733</b>	<b>698</b>	<b>621</b>	<b>535</b>	<b>440</b>	<b>342</b>						
Performance parameters test method		<b>Steady state - indoor</b>															
Performance parameters (related to A <sub>G</sub> )		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd						
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-						
Test results		<b>0,743</b>	<b>3,41</b>	<b>0,011</b>	<b>0,000</b>	<b>0,00</b>	<b>0</b>	<b>0,000</b>	<b>0,00</b>	<b>0,0E+00</b>	<b>0,91</b>						
Incidence angle modifier test method		<b>Steady state - outdoor</b>															
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°						
Transversal		K <sub>θT, coll</sub>	<b>1,00</b>	<b>0,99</b>	<b>0,97</b>	<b>0,94</b>	<b>0,89</b>	<b>0,80</b>	<b>0,62</b>	<b>0,06</b>	<b>0,00</b>						
Longitudinal		K <sub>θL, coll</sub>	<b>1,00</b>	<b>0,99</b>	<b>0,97</b>	<b>0,94</b>	<b>0,89</b>	<b>0,80</b>	<b>0,62</b>	<b>0,06</b>	<b>0,00</b>						
Heat transfer medium for testing		<b>Water</b>															
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt	<b>0,020</b>		kg/(sm <sup>2</sup> )												
Maximum temperature difference during thermal performance test		( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	<b>59</b>		K												
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )		$\vartheta_{stg}$	<b>216,4</b>		°C												
Maximum operating temperature		$\vartheta_{max, op}$	<b>210</b>		°C												
Maximum operating pressure		p <sub>max, op</sub>	<b>1000</b>		kPa												
Testing laboratory		<b>Fundación CENER - CIEMAT, LEST</b>					<a href="http://www.cener.com">http://www.cener.com</a>										
Test report(s)		<b>30.3300.0-014 R 30.3300.0-004 / 30.3300.0-016 R 30.3300.1 R</b>					Dated		<b>13/06/2019 25/06/2019</b>								
Comments of testing laboratory		Datasheet version: 6.0, 2018-10-30 The collectors models PA-SK and PA-SF were tested according to ISO 9806:2017. According to SKM rules, the results of the collector model PA-SF are representative for the whole PA family.															
																	
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2318 F
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Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	Standard Locations $\vartheta_m$	Athens			Davos			Stockholm			Würzburg		
		25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
PA-SK		1.889	1.349	888	1.438	998	635	1.054	695	426	1.149	750	452
PA-SD		2.313	1.651	1.087	1.760	1.221	778	1.291	851	522	1.407	918	554
PA-SE		2.668	1.904	1.254	2.030	1.409	897	1.489	982	602	1.623	1.059	639
PA-SF		3.161	2.256	1.485	2.405	1.669	1.062	1.764	1.163	713	1.922	1.254	757
Annual output per m <sup>2</sup> gross area		1.145	817	538	871	605	385	639	421	258	697	454	274
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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 $\vartheta_m$ (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 <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													

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 <sup>2</sup> ) >	1000	$\vartheta_a$ (°C) >	20	$H_x$ (MJ/m <sup>2</sup> ) >	600
Maximum tested positive load	2400		Pa		
Maximum tested negative load	2400		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 <sup>2</sup> )	Hydraulic Designation Code
PA-SK	1,65	8-V-1234S-A:7,1703-C:20,980-D
PA-SD	2,02	10-V-1234S-A:7,1788-C:20,1144-D
PA-SE	2,33	10-V-1234S-A:7,2068-C:20,1144-D
PA-SF	2,76	12-V-1234S-A:7,2070-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 ( $\eta_{col}$ )	58%	Zero-loss efficiency ( $\eta_0$ )	0,73
Remark: Collector efficiency ( $\eta_{col}$ ) 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 <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ 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 ( $a_1$ )	3,41
		Second-order coefficient ( $a_2$ )	0,011
		Incidence angle modifier IAM (50°)	0,89
		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 9806:2017. Consistent data sets for either aperture or gross area can be used in calculations like in the regulation 811 and 812 and simulation programs.	