



<b>Annex to Solar Keymark Certificate</b>					<b>Licence Number</b>		<b>SKM 10068</b>							
					<b>Date issued</b>		<b>2022-12-20</b>							
					<b>Issued by</b>		<b>DQS Hellas</b>							
<b>Licence holder</b>		<b>SONNE AKTION LTD</b>			<b>Country</b>		<b>Acountry</b>							
<b>Brand (optional)</b>		<b>Phaethon</b>			<b>Web</b>		<b>http://www.company.domain</b>							
<b>Street, Number</b>		<b>68 Km N.R. Athens - Lamia</b>			<b>E-mail</b>		<b>info@info.info</b>							
<b>Postcode, City</b>		<b>32009 Schimatari Viotias</b>			<b>Tel</b>		<b>+30 22620 59260</b>							
<b>Collector Type</b>					<b>Flat plate collector</b>									
<b>Collector name</b>					<b>Power output per collector</b> Gb = 850 W/m <sup>2</sup> , Gd = 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	83 K				
					m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
<b>ATLAS OL CA150</b>					1.50	1,500	998	76	963	910	782	627	443	306
<b>ATLAS OL CA160</b>					1.60	1,570	1,020	75	1,027	970	834	669	473	327
<b>ATLAS OL CA200</b>					1.99	1,965	1,015	75	1,278	1,207	1,038	832	588	406
<b>ATLAS OL CA230</b>					2.30	1,970	1,170	75	1,477	1,395	1,199	961	680	469
<b>ATLAS OL CA230HOR</b>					2.30	1,170	1,970	75	1,477	1,395	1,199	961	680	469
<b>Power output per m<sup>2</sup> gross area</b>					<b>642</b>	<b>606</b>	<b>521</b>	<b>418</b>	<b>296</b>	<b>204</b>				
<b>Performance parameters test method</b>		<b>Steady state - outdoor</b>												
<b>Performance parameters (related to A<sub>G</sub>)</b>		$\eta_{0, b}$	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
<b>Units</b>		-	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> )	-			
<b>Test results</b>		0.664	3.32	0.023	0.000	0.00	11,390	0.000	0.00	0.0E+00	0.78			
<b>Incidence angle modifier test method</b>		<b>Steady state - outdoor</b>												
<b>Incidence angle modifier</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
<b>Transversal</b>		K <sub>θT, coll</sub>	0.99	0.97	0.94	0.88	0.80	0.69	0.53	0.31	0.00			
<b>Longitudinal</b>		K <sub>θL, coll</sub>	0.99	0.97	0.94	0.88	0.80	0.69	0.53	0.31	0.00			
<b>Heat transfer medium for testing</b>					<b>Water</b>									
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>					dm/dt	0.022	kg/(sm <sup>2</sup> )							
<b>Maximum temperature difference during thermal performance test</b>					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	53.3	K							
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30^\circ\text{C}</math>)</b>					$\vartheta_{stg}$	172.5	°C							
<b>Maximum operating temperature</b>					$\vartheta_{max, op}$	100	°C							
<b>Maximum operating pressure</b>					p <sub>max, op</sub>	1000	kPa							
<b>Testing laboratory</b>		<b>NCSR "DEMOKRITOS"</b>					<b>www.solar.demokritos.gr</b>							
<b>Test report(s)</b>		4236 DE1 4237 DQ1 4239 DE1 4365 DE1					<b>Dated</b>		10/10/18 29/10/18 22/10/18 17/10/22					
<b>Comments of testing laboratory</b>					Ver. 6.2 (13.01.2022)									
					<b>N.C.S.R. "DEMOKRITOS"</b> SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544592 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece									
<b>Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +30 210 6233493-4 , Fax: +30 210 6233495, http://www.dqs.gr, e-mail: i.alexiou@dqs.gr</b>														

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<b>Supplementary Information</b>						<b>Issued</b>			<b>2022-12-20</b>					
<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>														
<b>Standard Locations</b>		<b>Athens</b>			<b>Davos</b>			<b>Stockholm</b>			<b>Würzburg</b>			
<b>Collector name</b>	<b><math>\vartheta_m</math></b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	
ATLAS OL CA150		1,380	888	475	1,005	608	294	748	433	209	811	460	220	
ATLAS OL CA160		1,472	947	507	1,071	649	313	798	462	223	865	491	234	
ATLAS OL CA200		1,830	1,178	630	1,333	807	390	993	574	278	1,076	611	291	
ATLAS OL CA230		2,116	1,361	728	1,540	932	450	1,148	664	321	1,244	706	337	
ATLAS OL CA230HOR		2,116	1,361	728	1,540	932	450	1,148	664	321	1,244	706	337	
Gross Thermal Yield per m <sup>2</sup> gross area		920	592	317	670	405	196	499	289	140	541	307	146	
Annual efficiency, $\eta_a$		52%	34%	18%	41%	25%	12%	43%	25%	12%	43%	25%	12%	
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)													
Annual irradiation on collector plane	1765 kWh/m <sup>2</sup>			1630 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. 6.2 (13.01.2022). A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>														
<b>Additional Information</b>														
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 <sub>x</sub> (MJ/m <sup>2</sup> ) >		600				
Maximum tested positive load									2400		Pa			
Maximum tested negative load									2400		Pa			
Hail resistance using steel ball (maximum drop height)									2		m			
<b>Additional collector attribute(s)</b>														
Using external power source(s) for normal operation						No			Active or passive measure(s) for self-protection				No	
Co-generating thermal and electrical power						No			Façade collector(s)				No	
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>								
					Reference Area, A <sub>sol</sub> (m <sup>2</sup> )		Hydraulic Designation Code			Aperture Area, A <sub>a</sub> (m <sup>2</sup> )				
ATLAS OL CA150					1.50		7-V-1234S-A:14.1,1435-C:20.6,1050-D			1.44				
ATLAS OL CA160					1.60		7-V-1234S-A:14.1,1455-C:20.6,1067-D			1.53				
ATLAS OL CA200					1.99		7-V-1234S-A:14.1,1855-C:20.6,1016-D			1.93				
ATLAS OL CA230					2.30		9-V-1234S-A:14.1,1855-C:20.6,1216-D			2.24				
ATLAS OL CA230HOR					2.30		15-V-1234S-A:14.1,1049-C:20.6,2045-D			2.24				
<b>Data required for CDR (EU) No 811/2013 - Reference Area</b>						<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>								
Collector efficiency ( $\eta_{col}$ )					47%		Zero-loss efficiency ( $\eta_0$ )			0.64		--		
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 <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.							First-order coefficient (a <sub>1</sub> )			3.32		W/(m <sup>2</sup> K)		
							Second-order coefficient (a <sub>2</sub> )			0.023		W/(m <sup>2</sup> K <sup>2</sup> )		
							Incidence angle modifier IAM (50°)			0.78		--		
							Remark: The data given in this section are related to collector reference area (A <sub>sol</sub> ) 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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