Annex to Solar Keymark Certificate

Licence Number	**SKM 9965/9**
Date issued	**2022-08-30**
Issued by	**DQS Hellas**

Licence holder	**NOBEL INTERNATIONAL EAD**	**Country**	BULGARIA
Brand (optional)	AELIOS AIB	**Web**	http://nobel.bg
Street, Number	48, VITOSHA BLV	**E-mail**	info@nobel.bg
Postcode, City	2100 ELIN PELIN	**Tel**	+359 2 4210232

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	94 K
	m²	mm	mm	mm	W	W	W	W	W	W
AELIOS AIB 1500	1.40	1,530	1,030	80	802	743	619	488	350	175
AELIOS AIB 2000	1.88	2,030	1,030	80	1,076	997	832	656	470	235
AELIOS AIB 2600	2.37	2,030	1,283	80	1,357	1,257	1,048	827	593	296
Power output per m² gross area					573	530	442	349	250	125

Performance parameters test method	Steady state - outdoor									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.591	4.14	0.007	0.000	0.00	7,860	0.000	0.00	0.0E+00	0.79

Incidence angle modifier test method		Steady state - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	0.98	0.95	0.90	0.82	0.71	0.55	0.33	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.98	0.95	0.90	0.82	0.71	0.55	0.33	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.018	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	64	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	138	°C
Maximum operating temperature	ϑ_{max_op}	100	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	NCSR Demokritos	www.solar.demokritos.gr	
Test report(s)	4080DE2 4082DE2 4086DQ2, 4213DQ1	**Dated**	05/09/13 05/09/13 5-9-2013, 21-3-2018

Comments of testing laboratory Ver. 6.2 (13.01.2022)

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Supplementary Information	Issued	2022-08-30

Gross Thermal Yield 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
AELIOS AIB 1500		1,152	678	353	794	458	226	597	322	156	650	343	164
AELIOS AIB 2000		1,547	911	474	1,066	615	303	801	433	209	873	460	220
AELIOS AIB 2600		1,951	1,148	598	1,344	776	382	1,010	546	263	1,101	580	278
Gross Thermal Yield per m² gross area		823	485	252	567	327	161	426	230	111	465	245	117
Annual efficiency, η_a		47%	27%	14%	35%	20%	10%	37%	20%	10%	37%	20%	9%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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 http://www.estif.org/solarkeymarknew/

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/m²) >	1000	ϑ_a (°C) >	20	H_X (MJ/m²) >		600
Maximum tested positive load					3000	Pa
Maximum tested negative load					3000	Pa
Hail resistance using steel ball (maximum drop height)					2	m

Additional collector attribute(s)

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

Energy Labelling Information

	Reference Area, A_{sol} (m²)
AELIOS AIB 1500	1.40
AELIOS AIB 2000	1.88
AELIOS AIB 2600	2.37

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
8-V-1234S-A:8,1342-C:20,1060-D	1.40
8-V-1234S-A:8,1842-C:20,1060-D	1.88
11-V-1234S-A:8,1842-C:20,1320-D	2.37

Data required for CDR (EU) No 811/2013 - Reference Area

Collector efficiency (η_{col})	40%

Remark: Collector efficiency (ηcol) 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 ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.57	--
First-order coefficient (a_1)	4.14	W/(m²K)
Second-order coefficient (a_2)	0.007	W/(m²K²)
Incidence angle modifier IAM (50°)	0.80	--

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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