



Annex to Solar Keymark Certificate					Licence Number		OEM 10061.5							
					Date issued		2023-09-20							
					Issued by		DQS Hellas							
Licence holder		KOURTALIDIS IOANNIS MON. Ltd			Country		Greece							
Brand (optional)					Web		www.wilco.gr							
Street, Number		Stadiou 3, Kalochori			E-mail		info@wilco.gr							
Postcode, City		57009 Thessaloniki			Tel		+30 2310 752038							
Collector Type					Flat plate collector									
Collector name					Gross area (A_G) m ²	Gross length mm	Gross width mm	Gross height mm	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	86 K W
WS 1.5					1,50	1.485	1.010	85	1.014	966	850	709	541	388
WS 1.75					1,75	1.730	1.010	85	1.183	1.127	992	827	631	453
WS 2.0					2,00	1.980	1.010	85	1.352	1.288	1.134	945	721	517
WS 2.3					2,30	1.980	1.160	85	1.555	1.481	1.304	1.086	829	595
WS 2.5					2,46	1.990	1.235	85	1.663	1.584	1.394	1.162	887	636
Power output per m ² gross area									676	644	567	472	361	259
Performance parameters test method					Steady state - outdoor									
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					0,693	2,99	0,022	0,000	0,00	9,084	0,000	0,00	0,0E+00	0,83
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	0,99	0,97	0,93	0,86	0,76	0,61	0,37	0,00
Longitudinal					$K_{\theta L, coll}$	1,00	0,99	0,97	0,93	0,86	0,76	0,61	0,37	0,00
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt		0,022		kg/(sm ²)					
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		56		K					
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30^\circ\text{C}$)					ϑ_{stg}		172		°C					
Maximum operating temperature					$\vartheta_{max, op}$				°C					
Maximum operating pressure					$p_{max, op}$		1000		kPa					
Testing laboratory					NCSR Demokritos / Solar & other Energy System Lab					www.solar.demokritos.gr				
Test report(s)					4240 DE1 4241 - 4242 DQ1 4243 DE1					Dated		31/10/2018 5/11/2018 30/10/2018		
Comments of testing laboratory					Ver. 6.2 (13.01.2022)									
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Supplementary Information						Issued		2023-09-20	

Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations ϑ_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
WS 1.5		1.535	1.067	639	1.161	763	424	856	537	294	928	576	309
WS 1.75		1.791	1.244	745	1.354	890	495	998	626	343	1.082	672	360
WS 2.0		2.047	1.422	852	1.548	1.017	566	1.141	716	392	1.237	768	412
WS 2.3		2.354	1.636	979	1.780	1.170	650	1.312	823	450	1.422	883	473
WS 2.5		2.517	1.749	1.047	1.904	1.251	696	1.404	881	482	1.521	945	506
Gross Thermal Yield per m ² gross area		1.023	711	426	774	509	283	571	358	196	618	384	206
Annual efficiency, η_a		58%	40%	24%	47%	31%	17%	49%	31%	17%	50%	31%	17%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1630 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. 6.2 (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/m ²) >	1000	ϑ_a (°C) >	20
		H_x (MJ/m ²) >	600
Maximum tested positive load			2400 Pa
Maximum tested negative load			2400 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		Additional Informative Technical Data	
	Reference Area, A_{sol} (m ²)	Hydraulic Designation Code	Aperture Area, A_a (m ²)
WS 1.5	1,50	8-V-24S-A:7.2,1380-C:20.6,1000-D	1,36
WS 1.75	1,75	8-V-24S-A:7.2,1650-C:20.6,1000-D	1,65
WS 2.0	2,00	8-V-24S-A:7.2,1880-C:20.6,1000-D	1,88
WS 2.3	2,30	9-V-24S-A:7.2,1880-C:20.6,1160-D	2,21
WS 2.5	2,46	10-V-24S-A:7.2,1880-C:20.6,1250-D	2,37

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})	52%	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)	2,99
		Second-order coefficient (a_2)	0,022
		Incidence angle modifier IAM (50°)	0,86
		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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