

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S1241 F
	Issued	2017-03-01

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_{m,}$ based on ISO 9806:2013 test results													
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
FK2-V4		3 026	2 219	1 513	2 334	1 666	1 101	1 712	1 158	736	1 858	1 252	782
FK2-H4		3 026	2 219	1 513	2 334	1 666	1 101	1 712	1 158	736	1 858	1 252	782
Annual output per m ² gross area		1 206	884	603	930	664	439	682	461	293	740	499	311
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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

Additional Information		
Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	2300	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

Energy Labelling Information			
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
FK2-V4	2.51	Collector efficiency (η_{col})	61 %
FK2-H4	2.51	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 9806:2013.	
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.756 --
		First-order coefficient (a_1)	3.27 W/(m ² K)
		Second-order coefficient (a_2)	0.011 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.94 --
		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.	

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S1952 F
	Issued	2017-05-22

Annual collector output in kWh/collector at mean fluid temperature ϑ_m based on ISO 9806:2013 test results													
Collector name	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
Serpentino ADV		3 026	2 219	1 513	2 334	1 666	1 101	1 712	1 158	736	1 858	1 252	782
Serpentino ADH		3 026	2 219	1 513	2 334	1 666	1 101	1 712	1 158	736	1 858	1 252	782
Annual output per m ² gross area		1 206	884	603	930	664	439	682	461	293	740	499	311
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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

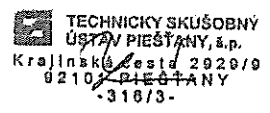
Additional Information

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	2300	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
Serpentino ADV	2.51	Collector efficiency (η_{col})	61 %
Serpentino ADH	2.51	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 9806:2013.	
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.756 --
		First-order coefficient (a_1)	3.27 W/(m ² K)
		Second-order coefficient (a_2)	0.011 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.94 --
		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.	



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		TSU 001-17/D							
					Date issued		2017-04-24							
					Issued by		TSU Piešťany, s.p.							
Licence holder		GREEN ENERGY SAVE GROUP, d.o.o.			Country		Serbia							
Brand (optional)					Web		www.gesg.rs							
Street, Number		Sumadijska 16A			E-mail		rajko.bojic@gesg.rs							
Postcode, City		Novi Sad			Tel		+381 638037405							
Collector Type					Flat plate collector, glazed									
Collector name					Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector $G_b = 850 \text{ W/m}^2$; $G_d = 150 \text{ W/m}^2$ $\vartheta_m - \vartheta_a$					
					m ²	mm	mm	mm	0 K	10 K	30 K	50 K	70 K	90 K
Meander 2.53					2,53	2 009	1 259	74	1 828	1 745	1 563	1 361	1 139	897
Power output per m ² gross area					723	690	618	538	450	354				
Performance parameters test method					Steady state - outdoor									
Performance parameters (related to A_G)					$\eta_{0,hem}$	a1	a2							
Units					-	W/(m ² K)	W/(m ² K ²)							
Test results					0,723	3,207	0,010							
Incidence angle modifier test method					Steady state - outdoor									
Bi-directional incidence angle modifiers					No									
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal					$K_{BT, coll}$					0,95				0,00
Longitudinal					$K_{BL, coll}$					0,95				0,00
Heat transfer medium for testing					Water-Glycole									
Flow rate for testing (per gross area, A_G)					dm/dt	0,012	kg/(sm ²)							
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$	90	K							
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ }^\circ\text{C}$)					ϑ_{st}	196	°C							
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²	5,375	kJ/(Km ²)							
Maximum operating temperature					$\vartheta_{max, op}$	100	°C							
Maximum operating pressure					$p_{max, op}$	600	kPa							
Testing laboratory		Technický skúšobný ústav Piešťany, s.p.			http://www.tsu.sk									
Test report(s)		110700001/1/PQ(D7)			Dated		21.4.2017							
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01									
Performance parameters - complete re-evaluation of the test data of the previous test (according to EN 12975-2:2006) taking into account gross area. This data sheet is not complete as the testing of the collector was performed according to EN 12975-2:2006(which is replaced by EN ISO 9806:2013)														
<p>Technický skúšobný ústav Piešťany, s.p. Address: Krajinská cesta 2929/9, 92101 Piešťany, Slovak Republic Phone: +421 33 79 57 111, Fax: +421 33 77 23 716, E-mail: sv@tsu.sk, web: www.tsu.eu</p>														



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	TSU 001-17/D
	Issued	2017-04-24

Annual collector output in kWh/collector at mean fluid temperature ϑ_{mf} based on ISO 9806:2013 test results													
Standard Locations	ϑ_{mf}	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
Collector name													
Meander 2.53		2 954	2 162	1 476	2 271	1 618	1 069	1 670	1 126	714	1 813	1 219	760
Annual output per m ² gross area		1 168	855	583	898	640	423	660	445	282	717	482	300
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°		
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Additional Information		
Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	C	--
Maximum tested positive load	2300	Pa
Maximum tested negative load	2500	Pa
Hail resistance using steel ball (maximum drop height)		m

Energy Labelling Information			
	Reference Area, A_{ref} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
Meander 2.53	2,53	Collector efficiency (η_{col})	58 %
		<i>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/m², 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 9806:2013.</i>	
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0,723 --
		First-order coefficient (a_1)	3,21 W/(m ² K)
		Second-order coefficient (a_2)	0,010 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0,95 --
		<i>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.</i>	

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