
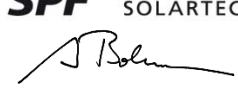


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S2689 F					
						Date issued		2016-12-15					
						Issued by							
Licence holder		Savo-Solar Oyj				Country		Finland					
Brand (optional)		-				Web		www.savosolar.fi					
Street, Number		Insinöörinkatu 7				E-mail		info@savosolar.fi					
Postcode, City		50150 Mikkeli				Tel		+358 (0)50 410 5247					
Collector Type						Flat plate collector, glazed							
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 ϑ _m - ϑ _a								
					0 K	10 K	30 K	50 K	70 K	130 K			
					W	W	W	W	W	W			
SF500-15DG	15.96	2'591	6'158	213	12'656	12'247	11'388	10'474	9'505	6'268			
Power output per m ² gross area					793	767	714	656	596	393			
Performance parameters test method		Steady state - outdoor											
Performance parameters (related to A _G)		η ₀ ,hem	a1	a2									
Units		-	W/(m ² K)	W/(m ² K ²)									
Test results		0.793	2.520	0.004									
Incidence angle modifier test method		Steady state - outdoor											
Bi-directional incidence angle modifiers		Yes											
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°		
Transversal		K _{GT, coll}	1.00	1.00	0.99	0.98	0.96	0.87	0.68	0.38	0.00		
Longitudinal		K _{GL, coll}	1.00	1.00	1.00	0.99	0.96	0.91	0.78	0.53	0.00		
Heat transfer medium for testing		Water-Glycole											
Flow rate for testing (per gross area, A _G)		dm/dt	0.020	kg/(sm ²)									
Maximum temperature difference for thermal performance calculations		(ϑ _m -ϑ _a) _{max}	130	K									
Standard stagnation temperature (G = 1000 W/m ² ; ϑ _a = 30 °C)		ϑ _{stg}	241	°C									
Effective thermal capacity, incl. fluid (per gross area, A _G)		C/m ²	12.0	kJ/(Km ²)									
Maximum operating temperature		ϑ _{max, op}	225	°C									
Maximum operating pressure		p _{max, op}	1000	kPa									
Testing laboratory		SPF, CH-8640 Rapperswil				www.spf.ch							
Test report(s)		C1705LPEN C1705QPEN				Dated		15.12.2016 15.12.2016					
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01							
--						 INSTITUT FÜR SOLARTECHNIK 							
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2689 F
	Issued	2016-12-15

Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on EN 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
SF500-15DG		20'535	16'565	13'032	16'720	13'330	10'398	12'050	9'191	6'906	13'036	9'939	7'381
Annual output per m ² gross area		1'287	1'038	817	1'048	835	652	755	576	433	817	623	462
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	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load with standard supports / with two individual supports	1100 / 3000	Pa
Maximum tested negative load with standard supports / with two individual supports	1100 / 2400	Pa
Hail resistance using ice balls (diameter)	45	mm

Energy Labelling Information				
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
SF500-15	15.96	Collector efficiency (η_{col})	69	%
		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)	0.793	--
		First-order coefficient (a_1)	2.52	W/(m ² K)
		Second-order coefficient (a_2)	0.004	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.97	--
		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.		