



Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2889 F				
					Date issued		2018-10-11				
					Issued by						
Licence holder		Savosolar Oyj			Country		Finland				
Brand (optional)					Web		www.savosolar.com				
Street, Number		Insinöörinkatu 7			E-mail		info@savosolar.com				
Postcode, City		50150 Mikkeli			Tel		+35 8102710810				
Collector Type					Flat plate collector, glazed						
Collector name	Gross area (A <sub>G</sub> ) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> $\vartheta_m - \vartheta_a$						
					0 K W	10 K W	30 K W	50 K W	70 K W	120 K W	
SF500-15SG-M	15.96	2'591	6'158	213	13'279	12'770	11'656	10'414	9'045	5'063	
Power output per m <sup>2</sup> gross area					832	800	730	653	567	317	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to AG)		$\eta_0, \text{hem}$	a1	a2							
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results		0.832	3.090	0.010							
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 <sub>GT, coll</sub>	1.00	1.00	0.99	0.98	0.96	0.88	0.70	0.39	0.00
Longitudinal		K <sub>GL, coll</sub>	1.00	1.00	1.00	0.98	0.96	0.89	0.77	0.51	0.00
Heat transfer medium for testing		Water-Glycole									
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt	0.020	kg/(sm <sup>2</sup> )							
Maximum temperature difference for thermal performance calculations		( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	120	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^\circ\text{C}$ )		$\vartheta_{stg}$	210	°C							
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )		C/m <sup>2</sup>	10.2	kJ/(Km <sup>2</sup> )							
Maximum operating temperature		$\vartheta_{max, op}$	225	°C							
Maximum operating pressure		p <sub>max, op</sub>	1000	kPa							
Testing laboratory		SPF, CH-8640 Rapperswil				www.spf.ch					
Test report(s)		C1704LPEN C1704QPEN C1786ISO				Dated		28.09.2016 28.09.2016 05.10.2018			
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01						
					 INSTITUT FÜR SOLARTECHNIK 						
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de											

<b>Annex to Solar Keymark Certificate Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2889 F</b>
	<b>Issued</b>	<b>2018-10-11</b>

**Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on EN ISO 9806:2013 test results**

Standard Locations Collector name	$\vartheta_m$	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
SF500-15SG-M		21'456	16'503	12'025	17'020	12'809	9'137	12'361	8'857	6'073	13'397	9'582	6'477
Annual output per m <sup>2</sup> gross area		1'344	1'034	753	1'066	803	573	775	555	380	839	600	406
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://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	1100	Pa
Maximum tested negative load	1100	Pa
Hail resistance using ice balls (diameter)	45	mm

**Energy Labelling Information**

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
SF500-15SG-M	15.96	Collector efficiency ( $\eta_{col}$ )	69 %
		<i>Remark: Collector efficiency (<math>\eta_{col}</math>) 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 <math>\eta_{col}</math> is based on reference area (<math>A_{sol}</math>) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.</i>	
		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>	
		Zero-loss efficiency ( $\eta_0$ )	0.832 --
		First-order coefficient ( $a_1$ )	3.09 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.010 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.96 --
		<i>Remark: The data given in this section are related to collector reference area (<math>A_{sol}</math>) 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>	