
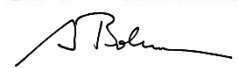


Annex to Solar Keymark Certificate					Licence Number		011-7S3108 F							
					Date issued		2022-03-24							
					Issued by		DIN CERTCO							
Licence holder		Savosolar Oyj			Country		Finland							
Brand (optional)		-			Web		https://savosolar.com							
Street, Number		Insinöörinkatu 7			E-mail		info@savosolar.com							
Postcode, City		FI-50150 Mikkeli			Tel		+358 10 271 0810							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	117 K				
					m ²	mm	mm	mm	mm	mm	mm			
SAVO 15S A					14.87	2'489	5'976	165	12'347	11'836	10'777	9'671	8'517	5'618
Power output per m ² gross area					830	796	725	650	573	378				
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		0.843	3.40	0.004	0.000	0.00	10'788	0.000	0.00	0.0E+00	0.90			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.00	0.99	0.98	0.97	0.95	0.86	0.69	0.39	0.00			
Longitudinal		K _{θL, coll}	1.00	1.00	0.99	0.98	0.95	0.88	0.74	0.49	0.00			
Heat transfer medium for testing					Water-Glycole									
Flow rate for testing (per gross area, A _G)					dm/dt	0.021	kg/(sm ²)							
Maximum temperature difference during thermal performance test					(ϑ _m -ϑ _a) _{max}	87	K							
Standard stagnation temperature (G = 1000 W/m ² ; ϑ _a = 30 °C)					ϑ _{stg}	220	°C							
Maximum operating temperature					ϑ _{max, op}	200	°C							
Maximum operating pressure					p _{max, op}	1000	kPa							
Testing laboratory		SPF Testing, CH-8640 Rapperswil, Switzerland					www.spf.ch							
Test report(s)		C1882ISO C1883ISO C1901					Dated		16.02.2022 15.02.2022 10.08.2022					
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
					 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														

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S3108 F
	Issued	2022-03-24

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
SAVO 15S A		19'733	15'013	11'048	15'524	11'694	8'546	11'287	8'049	5'635	12'242	8'697	6'002
Gross Thermal Yield per m ² gross area		1'327	1'010	743	1'044	786	575	759	541	379	823	585	404
Annual efficiency, η_a		75%	57%	42%	64%	48%	35%	65%	46%	32%	66%	47%	32%
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 Draft Ver. 6.2 (22.09.2021). 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	1150		Pa
Maximum tested negative load	1200		Pa
Hail resistance using ice balls (diameter)	45		mm

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)
SAVO 15S A	14.87	X-H-LRS-A:X-C38.0,2420	13.77

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})	69%	Zero-loss efficiency (η_0)	0.83
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)	3.40
		Second-order coefficient (a_2)	0.004
		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.	