



ICIM S.p.A. a socio unico

Piazza Don Enrico Mapelli, 75 - 20099 Sesto San Giovanni (MI)  
 Tel. 02/72534.1 - Fax 02/72002098 - e-mail: [info@icim.it](mailto:info@icim.it) - [www.icim.it](http://www.icim.it)  
 Capitale Soc EUR. 260.000,00 int. versato ed esistente  
 C.F./P. IVA e Iscriv. Reg. Imprese di Milano n. 12908230159 - R.E.A. n. 1596292

Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		0123BN				
					Date issued		2016-04-08				
					Issued by		ICIM S.p.A.				
Licence holder	MALTEZOS SA.				Country	Greece					
Brand (optional)					Web	<a href="http://www.maltezos.gr">www.maltezos.gr</a>					
Street, Number	55 Amfitheas AV, GR 175 64 P. Faliro				E-mail	<a href="mailto:info@maltezos.gr">info@maltezos.gr</a>					
Postcode, City	17564, Athens				Tel	+30 210 940 2015					
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> θ <sub>m</sub> - θ <sub>a</sub>						
					0 K W	10 K W	30 K W	50 K W	70 K W		
SAC 130x200	2,56	1.990	1.285	90	1.851	1.725	1.464	1.190	905		
SAC 100x200	1,98	1.994	994	90	1.432	1.334	1.132	921	700		
SAC 130x150	1,93	1.492	1.294	90	1.395	1.300	1.104	897	682		
SAC 100x150	1,48	1.492	994	90	1.070	997	846	688	523		
SAC 90x150	1,33	1.492	890	90	962	896	760	618	470		
Power output per m <sup>2</sup> gross area					723	674	572	465	353		
Performance parameters test method	Steady state - outdoor										
Performance parameters (related to AG)	η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>								
Units	-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )								
Test results	0,723	4,860	0,006								
Incidence angle modifier test method	Steady state - outdoor										
Bi-directional incidence angle modifiers	No	Quasi dynamic - outdoor									
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal	K <sub>θT, coll</sub>					0,82				0,00	
Longitudinal	K <sub>θL, coll</sub>					0,82				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	(θ <sub>m</sub> -θ <sub>a</sub> ) <sub>max</sub>	K									
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; θ <sub>a</sub> = 30 °C)	θ <sub>stg</sub>	162	°C								
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )	C/m <sup>2</sup>	10,93	kJ/(Km <sup>2</sup> )								
Maximum operating temperature	θ <sub>max, op</sub>	150	°C								
Maximum operating pressure	p <sub>max, op</sub>	100	kPa								
Testing laboratory	EUROFINS - MODULO UNO S.p.A. N.C.S.R. DEMOKRITOS				<a href="http://www.eurofins.it">www.eurofins.it</a> <a href="http://www.demokritos.gr">www.demokritos.gr</a>						
Test report(s)	M1.13.NRG.0296/49763 1235 DE1				Dated	10/09/2013 21/10/2015					
Comments of testing laboratory	<p>N.C.S.R. "D" Datasheet version: 5.01, 2016-03-01</p> <p>SOLAR ENERGY LABORATORY</p> <p>Head: Dr Vassilis Belessiotis</p> <p>Tel: +210 65403815 - Fax: +210 6544692</p> <p>153 10 Ag. Paraskevi - Attiki - Greece</p>										
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	0123BN
	Issued	2016-04-08

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

Collector name	Standard Locations $\vartheta_m$	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
SAC 130x200		2.614	1.601	903	1.853	1.133	615	1.372	786	418	1.491	833	435
SAC 100x200		2.022	1.238	699	1.433	877	476	1.061	608	323	1.153	644	336
SAC 130x150		1.971	1.207	681	1.397	855	464	1.035	592	315	1.124	628	328
SAC 100x150		1.511	926	522	1.071	655	356	793	454	241	862	482	251
SAC 90x150		1.358	832	469	962	589	320	713	408	217	774	433	226
Annual output per m <sup>2</sup> gross area		1.021	625	353	724	443	240	536	307	163	582	326	170
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	No	
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	1000	Pa
Maximum tested negative load	300	Pa
Hail resistance using steel ball (maximum drop height)	25	m

Energy Labelling Information

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
SAC 130x220	2,56	Collector efficiency ( $\eta_{col}$ )	52 %
SAC 100x200	1,98	<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>	
SAC 130x150	1,93		
SAC 100x150	1,48		
SAC 90x150	1,33		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0,723 --
		First-order coefficient ( $a_1$ )	4,86 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,006 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0,82 --
		<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>	