


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S2708 F							
						Date issued		2016-12-23							
						Issued by		DIN CERTCO							
Licence holder		THERMIC LTD.				Country		Greece							
Brand (optional)						Web		www.thermicsol.com							
Street, Number		26th Old National Road Athens-Thiva				E-mail		info@thermicsol.com							
Postcode, City		Mandra Attika 19600				Tel		+30 210 5555523 / 210 5555668							
Collector Type						Flat plate collector, glazed									
Collector name						Power output per collector Gb = 850 W/m ² ; Gd = 150 W/m ² ; u = 3 m/s $\vartheta_m - \vartheta_a$									
						Gross area (A _G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	112 K
						m ²	mm	mm	mm	W	W	W	W	W	W
THERMIC DELTA 2.5						2.53	2 008	1 258	85	1 734	1 643	1 450	1 243	1 022	512
THERMIC DELTA 2.25						2.24	1 893	1 183	85	1 537	1 456	1 285	1 102	906	454
THERMIC DELTA 2.0						2.02	2 006	1 007	85	1 386	1 314	1 159	994	817	409
THERMIC DELTA 2.0H						1.96	1 503	1 305	85	1 346	1 275	1 126	965	794	398
THERMIC DELTA 1.7						1.68	1 420	1 183	85	1 153	1 092	964	827	680	340
THERMIC DELTA 1.5						1.51	1 501	1 007	85	1 037	983	868	744	612	306
THERMIC DELTA 3.0						2.93	2 007	1 458	85	2 008	1 903	1 680	1 440	1 184	593
THERMIC DELTA 2.7						2.67	2 260	1 183	85	1 835	1 738	1 535	1 316	1 082	542
THERMIC DELTA 2.5H						2.52	1 257	2 006	85	1 730	1 640	1 447	1 241	1 020	511
Power output per m² gross area						686	650	574	492	405	203				
Performance parameters test method						Quasi dynamic									
Performance parameters (related to AG)						$\eta_{0,b}$	c1	c2	c3	c4	c6	Kd			
Units						-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	s/m	-			
Test results						0.687	3.534	0.007	0.000	0.000	0.000	0.993			
Incidence angle modifier test method						Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers						No									
Incidence angle modifier						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal						K _{θT, coll}	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.34	0.00
Longitudinal						K _{θL, coll}	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.34	0.00
Heat transfer medium for testing						Water									
Flow rate for testing (per gross area, A_G)						dm/dt		0.020		kg/(sm ²)					
Maximum temperature difference for thermal performance calculations						$(\vartheta_m - \vartheta_a)_{max}$		112		K					
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)						ϑ_{stg}		199		°C					
Effective thermal capacity, incl. fluid (per gross area, A_G)						C/m ²		11.515		kJ/(Km ²)					
Maximum operating temperature						$\vartheta_{max, op}$		n.a.		°C					
Maximum operating pressure						p _{max, op}		1600		kPa					
Testing laboratory						TZS, ITW University Stuttgart				www.itw.uni-stuttgart.de					
Test report(s)						10COL933/3OEM16				Dated		22.12.2016			
						10COL934/3OEM16						22.12.2016			
						10COL934Q/3OEM16						22.12.2016			
Comments of testing laboratory						Datashet version: 5.01, 2016-03-01									
<p>The data sheet replaces the data sheet issued on 22.12.2016</p> <p>The date of test reports was corrected from 10.10.2016 to 22.12.2016</p> <p>Documented performance parameters are taken from 10COL933/3OEM16 (Thermic DELTA 1.5)</p>						 TZS Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 8, 70560 Stuttgart (Vaihingen)									
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	011-7S2708 F
	Issued	2016-12-23

Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806:2013 test results													
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
THERMIC DELTA 2.5		2 810	1 981	1 300	2 108	1 448	921	1 556	1 008	615	1 704	1 096	658
THERMIC DELTA 2.25		2 492	1 756	1 153	1 869	1 284	816	1 379	894	545	1 510	972	583
THERMIC DELTA 2.0		2 247	1 584	1 040	1 686	1 158	736	1 244	806	492	1 362	877	526
THERMIC DELTA 2.0H		2 182	1 538	1 010	1 637	1 124	715	1 208	783	477	1 323	851	511
THERMIC DELTA 1.7		1 869	1 317	865	1 402	963	612	1 035	671	409	1 133	729	438
THERMIC DELTA 1.5		1 682	1 185	778	1 261	866	551	931	603	368	1 019	656	394
THERMIC DELTA 3.0		3 256	2 295	1 506	2 442	1 677	1 067	1 802	1 168	712	1 973	1 270	762
THERMIC DELTA 2.7		2 975	2 097	1 376	2 231	1 533	975	1 647	1 067	651	1 803	1 161	696
THERMIC DELTA 2.5H		2 805	1 977	1 298	2 104	1 445	919	1 553	1 006	614	1 701	1 095	657
Annual output per m ² gross area		1 113	784	515	835	573	365	616	399	243	674	434	260
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)	B	--	
Maximum tested positive load	2500	Pa	
Maximum tested negative load	2250	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}	
THERMIC DELTA 2.5	2.53	Collector efficiency (η_{col})	53 %
THERMIC DELTA 2.25	2.24	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.	
THERMIC DELTA 2.0	2.02		
THERMIC DELTA 2.0H	1.96		
THERMIC DELTA 1.7	1.68		
THERMIC DELTA 1.5	1.51		
THERMIC DELTA 3.0	2.93		
THERMIC DELTA 2.7	2.67		
THERMIC DELTA 2.5H	2.52		
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.686 --
		First-order coefficient (a_1)	3.53 W/(m ² K)
		Second-order coefficient (a_2)	0.007 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.92 --
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.			