



Annex to Solar Keymark Certificate					Licence Number		011-7S2636 F					
Summary of EN ISO 9806 Test Results					Issued		2016-04-06					
Collector test standard			EN ISO 9806									
Licence holder		TIGI LTD.			Country		Israel					
Brand (optional)		--			Web		www.tigisolar.com					
Street, Number		12 Modi-in St.			E-mail		info@tigisolar.com					
Postcode, City		IL-4927161, Petah Tikva			Tel		+972 3 6353626					
Collector Type					Evacuated tubular collector							
					Power output per collector $G_b = 850 \text{ W/m}^2$; $G_d = 150 \text{ W/m}^2$ $\vartheta_m - \vartheta_a$							
Collector name		Gross area (A_G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	130 K	
		m ²	mm	mm	mm	W	W	W	W	W	W	
TIGI HC1-A		2.09	2'027	1'030	195	1'416	1'375	1'291	1'201	1'106	791	
Power output per m² gross area					678	659	618	575	530	379		
Performance parameters test method		Steady state - outdoor										
Performance parameters (related to AG)		$\eta_{0,hem}$	a1	a2								
Units		-	W/(m ² K)	W/(m ² K ²)								
Test results		0.678	1.900	0.003								
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		$K_{\theta T, coll}$	0.99	0.98	0.96	0.93	0.88	0.78	0.65	0.38	0.00	
Longitudinal		$K_{\theta L, coll}$	1.00	0.99	0.98	0.95	0.89	0.80	0.65	0.40	0.00	
Fluid for testing		Water-Glycole										
Flow rate for testing (per gross area, AG)		dm/dt	0.021									kg/(sm ²)
Maximum temperature difference for thermal performance calculations		$(\vartheta_m - \vartheta_a)_{max}$	130									K
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ °C}$)		ϑ_{stg}	150									°C
Effective thermal capacity (per gross area, AG)		C/m ²	6.1									kJ/(Km ²)
Maximum operating temperature		$\vartheta_{max, op}$	139									°C
Maximum operating pressure		$p_{max, op}$	800									kPa
Testing laboratory		SPF, CH-8640 Rapperswil					www.spf.ch					
Test report(s)		C1679LPEN C1679LPEN					Dated		31.03.2016 31.03.2016			
Comments of testing laboratory												
--												
						 INSTITUT FÜR SOLARTECHNIK 						



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2636 F
	Issued	2016-04-06

Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on ISO 9806 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
TIGI HC1-A		2'201	1'808	1'455	1'812	1'473	1'179	1'306	1'019	788	1'406	1'096	838
Annual output per m ² gross area		1'054	866	697	868	706	565	625	488	377	673	525	401
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 (July 2015). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													

Additional Information		
Collector heat transfer medium	Liquid	
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 under the following conditions:		
Climate class (A, B or C)	A	--
Positive Mechanical Load	2400	Pa
Negative Mechanical Load	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}	
TIGI HC1-A	2.09	Collector efficiency (η_{col})	60 %
		<i>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/m², 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.</i>	
		Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}	
		Zero-loss efficiency (η_0)	0.678 --
		First-order coefficient (a_1)	1.90 W/(m ² K)
		Second-order coefficient (a_2)	0.003 W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.88 --
		<i>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.</i>	