



<b>Annex to Solar Keymark Certificate</b>		Licence Number	<b>SKM 10161</b>
		Date issued	<b>2023-08-15</b>
		Issued by	<b>DQS Hellas</b>
Licence holder	<b>TOKAS IOANNIS C.O.</b>	Country	<b>Greece</b>
Brand (optional)		Web	<a href="http://www.typor.gr">http://www.typor.gr</a>
Street, Number	<b>Thrakis 21</b>	E-mail	<a href="mailto:info@typor.gr">info@typor.gr</a>
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Collector Type **Flat plate collector**

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					
					Gb = 850 W/m <sup>2</sup> , Gd = 150 W/m <sup>2</sup> & u = 1.3 m/s ϑ <sub>m</sub> - ϑ <sub>a</sub>					
					0 K W	10 K W	30 K W	50 K W	70 K W	77 K W
<b>TRSC0085</b>	1,40	1.650	850	70	855	803	685	548	392	332
<b>TRSC0110</b>	1,82	1.650	1.100	70	1.112	1.044	891	712	509	432
<b>TRSC0125</b>	2,06	1.650	1.250	70	1.258	1.182	1.008	806	576	489

Power output per m<sup>2</sup> gross area **611 574 489 391 280 237**


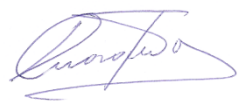
Performance parameters test method	<b>Steady state - outdoor</b>									
Performance parameters (related to A <sub>G</sub> )	η <sub>0</sub> , b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-
Test results	<b>0,623</b>	<b>3,54</b>	<b>0,017</b>	<b>0,000</b>	<b>0,00</b>	<b>10.000</b>	<b>0,000</b>	<b>0,00</b>	<b>0,0E+00</b>	<b>0,87</b>

Incidence angle modifier test method	<b>Steady state - outdoor</b>									
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	K <sub>GT, coll</sub>	1,00	1,00	0,98	0,96	0,91	0,82	0,68	0,43	0,00
Longitudinal	K <sub>GL, coll</sub>	1,00	1,00	0,98	0,96	0,91	0,82	0,68	0,43	0,00

Heat transfer medium for testing	<b>Water</b>		
Flow rate for testing (per gross area, A <sub>G</sub> )	dm/dt	<b>0,020</b>	<b>kg/(sm<sup>2</sup>)</b>
Maximum temperature difference during thermal performance test	(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>	<b>47</b>	<b>K</b>
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ϑ <sub>a</sub> = 30 °C)	ϑ <sub>stg</sub>	<b>150</b>	<b>°C</b>
Maximum operating temperature	ϑ <sub>max op</sub>	<b>-</b>	<b>°C</b>
Maximum operating pressure	p <sub>max, op</sub>	<b>1000</b>	<b>kPa</b>

Testing laboratory	<b>AELAB - Applied Energy Laboratory</b>	<a href="http://www.aelab.gov.cy/">http://www.aelab.gov.cy/</a>
Test report(s)	<b>Σ.29.05.23.01 Σ.29.05.23.02 Σ.29.05.23.03</b>	<b>Dated</b> <b>9/8/2023 9/8/2023 9/8/2023</b>

Comments of testing laboratory **Ver. 6.2 (13.01.2022)**



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	SKM 10161
	Issued	2023-08-15

Gross Thermal Yield in kWh/collector at mean fluid temperature $\vartheta_m$													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
TRSC0085		1.323	854	469	959	588	295	714	414	206	778	444	217
TRSC0110		1.721	1.110	609	1.246	764	384	928	538	267	1.011	578	282
TRSC0125		1.947	1.257	690	1.411	865	434	1.050	610	303	1.145	654	320
Gross Thermal Yield per m <sup>2</sup> gross area		945	610	335	685	420	211	510	296	147	556	317	155
Annual efficiency, $\eta_a$		54%	35%	19%	42%	26%	13%	44%	25%	13%	45%	26%	12%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 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. 6.2 (13.01.2022). 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 <sup>2</sup> ) >	1000	$\vartheta_a$ (°C) >	20	H <sub>x</sub> (MJ/m <sup>2</sup> ) >	600
Maximum tested positive load	2400		Pa		
Maximum tested negative load	2400		Pa		
Hail resistance using steel ball (maximum drop height)	0,4		m		
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 <sub>sol</sub> (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, A <sub>a</sub> (m <sup>2</sup> )
TRSC0085	1,40	7-V-1234S-A:7.2,1530-C:20.4,845	1,30
TRSC0110	1,82	9-V-1234S-A:7.2,1530-C:20.4,1150	1,72
ALUTHERM 2.5	2,06	11-V-1234S-A:7.2,1530-C:20.4,1240	1,95

Data required for CDR (EU) No 811/2013 - Reference Area A <sub>sol</sub>		Data required for CDR (EU) No 812/2013 - Reference Area A <sub>sol</sub>	
Collector efficiency ( $\eta_{col}$ )	44%	Zero-loss efficiency ( $\eta_0$ )	0,61
Remark: Collector efficiency ( $\eta_{col}$ ) 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 <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area (A <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.		First-order coefficient (a <sub>1</sub> )	3,54
		Second-order coefficient (a <sub>2</sub> )	0,017
		Incidence angle modifier IAM (50°)	0,91
		Remark: The data given in this section are related to collector reference area (A <sub>sol</sub> ) 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.	