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IGTE

Annex to Solar Keymark Certificate		Licence Number	011-7S3097 F
		Date issued	2022-01-26
		Issued by	DIN CERTCO
Licence holder	KYRIAZIS SA	Country	Greece
Brand (optional)		Web	www.e-kyriazis.gr
Street, Number	Arachos - Platy	E-mail	info@e-kyriazis.gr
Postcode, City	59300	Tel	+30 233 30 64 330

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	112 K
	m²	mm	mm	mm	W	W	W	W	W	W
GSS 150	1.51	1 503	1 007	85	1 093	1 038	921	797	666	367
GSS 200	2.02	2 006	1 007	85	1 462	1 388	1 232	1 066	891	491
GSS 230	2.24	1 893	1 183	85	1 622	1 539	1 366	1 183	988	545
GSS 250	2.52	2 006	1 257	85	1 824	1 732	1 537	1 330	1 112	613
Power output per m² gross area					724	687	610	528	441	243

Performance parameters test method	Quasi dynamic									
Performance parameters (related to A_G)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.725	3.62	0.006	0.000	0.00	13 660	0.000	0.00	0.0E+00	0.99

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	1.00	1.00	0.99	0.96	0.87	0.63	0.32	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	1.00	0.99	0.96	0.87	0.63	0.32	0.00

Heat transfer medium for testing		Water-Glycole	
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	82	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	230	°C
Maximum operating temperature	ϑ_{max_op}	-	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
Test report(s)	21COL1632OEM01 21COL1631QOEM01	Dated	26.01.2022 26.01.2022

Comments of testing laboratory	Ver. 6.2 (13.01.2022)
Documented performance parameters are taken from21COL1632OEM01 (GSS 150)	TZS Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

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Supplementary Information	Issued	2022-01-26

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
GSS 150	1 793	1 287	870	1 362	959	636	998	662	419	1 092	720	450
GSS 200	2 399	1 722	1 164	1 822	1 283	851	1 335	886	561	1 460	963	602
GSS 230	2 660	1 909	1 291	2 021	1 423	944	1 480	982	622	1 620	1 068	668
GSS 250	2 993	2 148	1 452	2 273	1 601	1 062	1 665	1 105	700	1 822	1 202	751
Gross Thermal Yield per m² gross area	1 188	852	576	902	635	421	661	439	278	723	477	298
Annual efficiency, η_a	67%	48%	33%	55%	39%	26%	57%	38%	24%	58%	38%	24%
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >	600
Maximum tested positive load				2750	Pa
Maximum tested negative load				2400	Pa
Hail resistance using steel ball (maximum drop height)				2	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

	Reference Area, A_{sol} (m²)
GSS 150	1.51
GSS 200	2.02
GSS 230	2.24
GSS 250	2.52

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
8-V-1234S-7.2,1383-20.6,1060-D	1.36
8-V-1234S-7.2,1888-20.6,1060-D	1.83
10-V-1234S-7.2,1773-20.6,1240-D	2.05
11-V-1234S-7.2,1888-20.6,1310-D	2.32

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	57%

Remark: Collector efficiency (ηcol) 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 ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.72	--
First-order coefficient (a_1)	3.62	W/(m²K)
Second-order coefficient (a_2)	0.006	W/(m²K²)
Incidence angle modifier IAM (50°)	0.98	--

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.