


Annex to Solar Keymark Certificate					Licence Number		011-7S3213 F							
					Date issued		2023-11-15							
					Issued by		DIN CERTCO							
Licence holder		DIMAS SA			Country		Greece							
Brand (optional)					Web		www.dimas-solar.gr							
Street, Number		2nd km Argos-Nafplio			E-mail		td@dimas-solar.gr							
Postcode, City		21200, Argos			Tel		+30 27510 20920							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s θ _m - θ _a									
					0 K	10 K	30 K	50 K	70 K	141 K				
					m ²	mm	mm	mm	mm	mm	mm			
					W	W	W	W	W	W				
ENERGY+GEO 15					1.51	1,503	1,007	85	1,021	963	834	688	526	0
ENERGY+GEO 17					1.68	1,420	1,183	85	1,136	1,071	928	766	585	0
ENERGY+GEO 19					1.96	1,503	1,305	85	1,325	1,250	1,083	894	683	0
ENERGY+GEO 20					2.02	2,006	1,007	85	1,366	1,288	1,116	921	704	0
ENERGY+GEO 23					2.24	1,893	1,183	85	1,514	1,428	1,237	1,021	780	0
ENERGY+GEO 25					2.52	2,006	1,257	85	1,704	1,607	1,392	1,149	878	0
ENERGY+GEO 27					2.67	2,261	1,183	85	1,805	1,702	1,475	1,217	930	0
ENERGY+GEO 29					2.92	2,006	1,457	85	1,974	1,862	1,613	1,331	1,017	0
Power output per m² gross area					676	638	552	456	348	0				
Performance parameters test method		Quasi dynamic												
Performance parameters (related to A_G)		η ₀ , b	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-			
Test results		0.679	3.70	0.014	0.000	0.00	17,680	0.000	0.00	0.0E+00	0.97			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.00	0.99	0.98	0.97	0.94	0.86	0.62	0.31	0.00			
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.97	0.94	0.86	0.62	0.31	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 during thermal performance test		(θ _m -θ _a) _{max}	111	K										
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)		θ _{stg}	190	°C										
Maximum operating temperature		θ _{max op}	n.sp.	°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)		23COL1703 23COL1704 23COL1704Q						Dated		15.11.2023 15.11.2023 15.11.2023				
Comments of testing laboratory		Documented performance parameters are taken from test report 23COL1703 (ENERGY+GEO 15)						Ver. 6.2 (13.01.2022)						
								 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)						
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Supplementary Information							Issued		2023-11-15											
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							
ENERGY+GEO 15		1,638	1,105	660	1,207	779	436	894	546	298	980	593	317							
ENERGY+GEO 17		1,822	1,229	734	1,343	867	485	994	608	331	1,090	660	353							
ENERGY+GEO 19		2,126	1,434	856	1,566	1,012	566	1,160	709	386	1,272	770	412							
ENERGY+GEO 20		2,191	1,478	882	1,614	1,042	583	1,196	731	398	1,310	793	425							
ENERGY+GEO 23		2,429	1,639	978	1,790	1,156	646	1,326	810	442	1,453	880	471							
ENERGY+GEO 25		2,733	1,844	1,101	2,014	1,301	727	1,491	912	497	1,635	990	530							
ENERGY+GEO 27		2,895	1,954	1,166	2,134	1,378	770	1,580	966	526	1,732	1,049	561							
ENERGY+GEO 29		3,167	2,137	1,275	2,334	1,507	843	1,728	1,056	576	1,894	1,147	614							
Gross Thermal Yield per m ² gross area		1,084	732	437	799	516	289	592	362	197	649	393	210							
Annual efficiency, η_a		61%	41%	25%	49%	32%	18%	51%	31%	17%	52%	32%	17%							
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)																		
Annual irradiation on collector plane		1765 kWh/m ²			1630 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. 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 ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >		600										
Maximum tested positive load							2750			Pa										
Maximum tested negative load							2500			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					Additional Informative Technical Data															
	Reference Area, A _{sol} (m ²)				Hydraulic Designation Code				Aperture Area, A _a (m ²)											
ENERGY+GEO 15	1.51				8-V-1234S-14.1,1390-20.6,1060-D				1.36											
ENERGY+GEO 17	1.68				10-V-1234S-14.1,1310-20.6,1240-D				1.52											
ENERGY+GEO 19	1.96				11-V-1234S-14.1,1390-20.6,1370-D				1.79											
ENERGY+GEO 20	2.02				8-V-1234S-14.1,1895-20.6,1060-D				1.83											
ENERGY+GEO 23	2.24				10-V-1234S-14.1,1782-20.6,1240-D				2.05											
ENERGY+GEO 25	2.52				11-V-1234S-14.1,1895-20.6,1310-D				2.32											
ENERGY+GEO 27	2.67				10-V-1234S-14.1,2150-20.6,1240-D				2.46											
ENERGY+GEO 29	2.92				12-V-1234S-14.1,1895-20.6,1510-D				2.71											
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}					Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}															
Collector efficiency (η_{col})					51%				Zero-loss efficiency (η_0)				0.68				--			
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 9806:2017.									First-order coefficient (a ₁)				3.70				W/(m ² K)			
									Second-order coefficient (a ₂)				0.014				W/(m ² K ²)			
									Incidence angle modifier IAM (50°)				0.95				--			
									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.											
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