TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate

Licence Number	**011-7S1491 F**
Date issued	**2019-10-14**
Issued by	**DIN CERTCO**

Licence holder	**DIMAS SA Solar Energy Systems**	**Country**	Greece
Brand (optional)	-	**Web**	www.dimas-solar.gr
Street, Number	2nd km Argos - Nafplion	**E-mail**	info@dimas-solar.gr
Postcode, City	21200, Argos	**Tel**	+30 275 10209110

Collector Type	Flat plate collector

Collector name	**Gross height**	**Gross area (A_G)**	**Gross length**	**Gross width**	**Aperture area (A_a)**	**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
	mm	m²	mm	mm	m²	W	W	W	W	W	W
ENERGY+EVO 15	85	1.51	1 501	1 007	1.35	1 036	982	867	743	611	306
ENERGY+EVO 17	85	1.68	1 420	1 183	1.51	1 153	1 092	964	827	680	340
ENERGY+EVO 19	85	1.96	1 503	1 305	1.79	1 345	1 274	1 125	964	793	397
ENERGY+EVO 20	85	2.02	2 006	1 007	1.83	1 386	1 313	1 159	994	817	409
ENERGY+EVO 20H	85	2.02	1 007	2 006	1.83	1 386	1 313	1 159	994	817	409
ENERGY+EVO 23	85	2.24	1 893	1 183	2.03	1 537	1 457	1 286	1 102	906	454
ENERGY+EVO 25	85	2.53	2 008	1 258	2.31	1 736	1 645	1 452	1 245	1 024	513
ENERGY+EVO 25H	85	2.52	1 257	2 006	2.33	1 729	1 639	1 446	1 240	1 020	511
ENERGY+EVO 27	85	2.67	2 260	1 183	2.51	1 832	1 736	1 532	1 314	1 080	541
ENERGY+EVO 29	85	2.93	2 007	1 458	2.72	2 011	1 905	1 682	1 442	1 185	594
Power output per m² gross area						686	650	574	492	405	203

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	0.687	3.53	0.007	0.000	0.00	11 515	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	0.99	0.96	0.92	0.86	0.73	0.34	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.99	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/(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}	199 °C
Maximum operating temperature		$\vartheta_{max\ op}$	n.a. °C
Maximum operating pressure		$p_{max,op}$	1000 kPa

Testing laboratory	TZS, ITW University Stuttgart	www.itw.uni-stuttgart.de	
Test report(s)	10COL933/4	**Dated**	15.08.2019
	10COL934/3		10.08.2016
	10COL934Q/4		15.08.2019

Comments of testing laboratory — Datasheet version: 6.0, 2018-10-30

This data sheet replaces the data sheet issuded on 29.09.2016
Documented performance parameters are taken from 10COL933/4 (Energy + EVO 15)
ENERGY + EVO 20H is added.

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	2019-10-14

Annual collector output 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+EVO 15		1 686	1 190	783	1 266	872	556	934	606	371	1 022	659	397
ENERGY+EVO 17		1 876	1 324	871	1 409	970	619	1 039	675	412	1 137	733	441
ENERGY+EVO 19		2 189	1 545	1 017	1 644	1 132	722	1 212	787	481	1 327	856	515
ENERGY+EVO 20		2 256	1 592	1 048	1 694	1 166	744	1 249	811	496	1 367	882	531
ENERGY+EVO 20H		2 256	1 592	1 048	1 694	1 166	744	1 249	811	496	1 367	882	531
ENERGY+EVO 23		2 502	1 766	1 162	1 879	1 293	825	1 385	899	550	1 516	978	588
ENERGY+EVO 25		2 825	1 994	1 312	2 122	1 461	932	1 564	1 016	621	1 713	1 104	665
ENERGY+EVO 25H		2 814	1 987	1 307	2 114	1 455	928	1 558	1 012	618	1 706	1 100	662
ENERGY+EVO 27		2 982	2 105	1 385	2 239	1 541	984	1 651	1 072	655	1 807	1 165	701
ENERGY+EVO 29		3 272	2 310	1 520	2 457	1 692	1 080	1 812	1 176	719	1 983	1 279	770
Annual output per m² gross area		1 117	788	519	839	577	368	618	402	245	677	436	263
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1714 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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

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)				B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				2500	Pa
Maximum tested negative load				2250	Pa
Hail resistance using steel ball (maximum drop height)				n.a.	m

Additional collector attribute(s)

- ☐ Using external power source(s) for normal operation
- ☐ Active or passive measure(s) for self-protection
- ☐ Co-generating thermal and electrical power
- ☐ Wind and/or infrared sensitive collector(s) (WISC)
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)	Hydraulic Designation Code
ENERGY+EVO 15	1.51	8-V-1234S-A:7.2,1389-C:20.6,1060-D
ENERGY+EVO 17	1.68	10-V-1234S-A:7.2,1309-C:20.6,1240-D
ENERGY+EVO 19	1.96	11-V-1234S-A:7.2,1389-C:20.6,1370-D
ENERGY+EVO 20	2.02	8-V-1234S-A:7.2,1894-C:20.6,1060-D
ENERGY+EVO 20H	2.02	17-V-1234S-A:7.2,897-C:20.6,2080-D
ENERGY+EVO 23	2.24	10-V-1234S-A:7.2,1779-C:20.6,1240-D
ENERGY+EVO 25	2.53	11-V-1234S-A:7.2,1894-C:20.6,1310-D
ENERGY+EVO 25H	2.53	17-V-1234S-A:7.2,1144-C:20.6,2080-D
ENERGY+EVO 27	2.67	10-V-1234S-A:7.2,2149-C:20.6,1240-D
ENERGY+EVO 29	2.93	12-V-1234S-A:7.2,1894-C:20.6,1510-D

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})	53%	Zero-loss efficiency (η_0)	0.69	--
		First-order coefficient (a_1)	3.53	W/(m²K)
		Second-order coefficient (a_2)	0.007	W/(m²K²)
		Incidence angle modifier IAM (50°)	0.93	--

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.

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.