Annex to Solar Keymark Certificate		Licence Number	011-7S1491 F
		Date issued	2020-06-24
		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 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
ENERGY+EVO 15	1.51	1 501	1 007	85	1 036	981	866	743	611	306
ENERGY+EVO 17	1.68	1 420	1 183	85	1 152	1 092	964	827	680	341
ENERGY+EVO 19	1.96	1 503	1 305	85	1 345	1 274	1 125	964	793	397
ENERGY+EVO 20	2.02	2 006	1 007	85	1 386	1 313	1 159	994	817	410
ENERGY+EVO 20H	2.02	1 007	2 006	85	1 386	1 313	1 159	994	817	410
ENERGY+EVO 23	2.24	1 893	1 183	85	1 537	1 456	1 285	1 102	906	454
ENERGY+EVO 25	2.53	2 008	1 258	85	1 736	1 644	1 452	1 245	1 024	513
ENERGY+EVO 25H	2.52	1 257	2 006	85	1 729	1 638	1 446	1 240	1 020	511
ENERGY+EVO 27	2.67	2 260	1 183	85	1 832	1 735	1 532	1 314	1 080	541
ENERGY+EVO 29	2.93	2 007	1 458	85	2 010	1 904	1 681	1 441	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	0.0	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-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}	199	°C
Maximum operating temperature	$\vartheta_{max\ op}$	n.a.	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
	10COL933/5		24.06.2020
	10COL934/4		24.06.2020
	10COL934Q/5		24.06.2020

Comments of testing laboratory — Datasheet version: 6.1, 2019-09-26

This data sheet replaces the data sheet issued on 29.01.2020
Thermal performance parameters are given from 10COL933/5 (Energy + EVO 15)
The brand series PRO+V is added (see page 3 and 4)

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

Annex to Solar Keymark Certificate	Licence Number	011-7S1491 F
Supplementary Information	Issued	2020-06-24

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		1 685	1 190	783	1 266	872	557	933	606	371	1 021	659	397
ENERGY+EVO 17		1 875	1 324	871	1 408	970	619	1 038	674	413	1 136	733	441
ENERGY+EVO 19		2 187	1 544	1 016	1 643	1 131	722	1 211	787	481	1 325	855	515
ENERGY+EVO 20		2 254	1 591	1 048	1 693	1 166	745	1 248	811	496	1 366	881	531
ENERGY+EVO 20H		2 254	1 591	1 048	1 693	1 166	745	1 248	811	496	1 366	881	531
ENERGY+EVO 23		2 499	1 765	1 162	1 877	1 293	826	1 384	899	550	1 515	977	589
ENERGY+EVO 25		2 823	1 993	1 312	2 121	1 460	933	1 563	1 016	621	1 711	1 104	665
ENERGY+EVO 25H		2 812	1 985	1 307	2 112	1 454	929	1 557	1 012	619	1 704	1 099	662
ENERGY+EVO 27		2 979	2 103	1 385	2 238	1 541	984	1 650	1 072	656	1 806	1 165	702
ENERGY+EVO 29		3 269	2 308	1 519	2 456	1 691	1 080	1 811	1 176	720	1 981	1 278	770
Annual output per m² gross area		1 116	788	519	838	577	369	618	401	246	676	436	263
Annual efficiency, η_a		63%	45%	29%	51%	35%	23%	53%	34%	21%	54%	35%	21%
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. 6.1 (September 2019). 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)				B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				2500	Pa
Maximum tested negative load				2500	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
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)
ENERGY+EVO 15	1.51
ENERGY+EVO 17	1.68
ENERGY+EVO 19	1.96
ENERGY+EVO 20	2.02
ENERGY+EVO 20H	2.02
ENERGY+EVO 23	2.24
ENERGY+EVO 25	2.53
ENERGY+EVO 25H	2.52
ENERGY+EVO 27	2.67
ENERGY+EVO 29	2.93

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

Collector efficiency (η_{col})	53%

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.

Additional Informative Technical Data

	Hydraulic Designation Code	Aperature Area, A_a (m²)
ENERGY+EVO 15	8-V-1234S-A:7.2,1389-C:20.6,1060-D	1.35
ENERGY+EVO 17	10-V-1234S-A:7.2,1309-C:20.6,1240-D	1.51
ENERGY+EVO 19	11-V-1234S-A:7.2,1389-C:20.6,1370-D	1.79
ENERGY+EVO 20	8-V-1234S-A:7.2,1894-C:20.6,1060-D	1.83
ENERGY+EVO 20H	17-V-1234S-A:7.2,897-C:20.6,2080-D	1.83
ENERGY+EVO 23	10-V-1234S-A:7.2,1779-C:20.6,1240-D	2.03
ENERGY+EVO 25	11-V-1234S-A:7.2,1894-C:20.6,1310-	2.31
ENERGY+EVO 25H	17-V-1234S-A:7.2,1144-C:20.6,2080-	2.33
ENERGY+EVO 27	10-V-1234S-A:7.2,2149-C:20.6,1240-	2.51
ENERGY+EVO 29	12-V-1234S-A:7.2,1894-C:20.6,1510-	2.72

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

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: 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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Annex to Solar Keymark Certificate		Licence Number	011-7S1491 F
		Date issued	2020-06-24
		Issued by	DIN CERTCO

Licence holder	DIMAS SA Solar Energy Systems	Country	Greece		
Brand (optional)	PRO+V	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 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
PRO+V150	1.51	1 501	1 007	85	1 036	981	866	743	611	306
PRO+V175	1.68	1 420	1 183	85	1 152	1 092	964	827	680	341
PRO+V200A	1.96	1 503	1 305	85	1 345	1 274	1 125	964	793	397
PRO+V200B	2.02	2 006	1 007	85	1 386	1 313	1 159	994	817	410
PRO+V200H	2.02	1 007	2 006	85	1 386	1 313	1 159	994	817	410
PRO+V230	2.24	1 893	1 183	85	1 537	1 456	1 285	1 102	906	454
PRO+V250	2.53	2 008	1 258	85	1 736	1 644	1 452	1 245	1 024	513
PRO+V250H	2.52	1 257	2 006	85	1 729	1 638	1 446	1 240	1 020	511
PRO+V270	2.67	2 260	1 183	85	1 832	1 735	1 532	1 314	1 080	541
PRO+V290	2.93	2 007	1 458	85	2 010	1 904	1 681	1 441	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	0.0	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-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}	199	°C
Maximum operating temperature	$\vartheta_{max\ op}$	n.a.	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
	10COL933/5		24.06.2020
	10COL934/4		24.06.2020
	10COL934Q/5		24.06.2020

Comments of testing laboratory	Datasheet version: 6.1, 2019-09-26
	Stamp & signature of test lab

Annex to Solar Keymark Certificate	Licence Number	011-7S1491 F
Supplementary Information	Issued	2020-06-24

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
PRO+V150	1 685	1 190	783	1 266	872	557	933	606	371	1 021	659	397
PRO+V175	1 875	1 324	871	1 408	970	619	1 038	674	413	1 136	733	441
PRO+V200A	2 187	1 544	1 016	1 643	1 131	722	1 211	787	481	1 325	855	515
PRO+V200B	2 254	1 591	1 048	1 693	1 166	745	1 248	811	496	1 366	881	531
PRO+V200H	2 254	1 591	1 048	1 693	1 166	745	1 248	811	496	1 366	881	531
PRO+V230	2 499	1 765	1 162	1 877	1 293	826	1 384	899	550	1 515	977	589
PRO+V250	2 823	1 993	1 312	2 121	1 460	933	1 563	1 016	621	1 711	1 104	665
PRO+V250H	2 812	1 985	1 307	2 112	1 454	929	1 557	1 012	619	1 704	1 099	662
PRO+V270	2 979	2 103	1 385	2 238	1 541	984	1 650	1 072	656	1 806	1 165	702
PRO+V290	3 269	2 308	1 519	2 456	1 691	1 080	1 811	1 176	720	1 981	1 278	770
Annual output per m² gross area	1 116	788	519	838	577	369	618	401	246	676	436	263
Annual efficiency, η_a	63%	45%	29%	51%	35%	23%	53%	34%	21%	54%	35%	21%
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. 6.1 (September 2019). 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)				B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				2500	Pa
Maximum tested negative load				2500	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
- ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)
PRO+V150	1.51
PRO+V175	1.68
PRO+V200A	1.96
PRO+V200B	2.02
PRO+V200H	2.02
PRO+V230	2.24
PRO+V250	2.53
PRO+V250H	2.52
PRO+V270	2.67
PRO+V290	2.93

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

Collector efficiency (η_{col})	53%

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.

Additional Informative Technical Data

	Hydraulic Designation Code	Aperature Area, A_a (m²)
PRO+V150	8-V-1234S-A:7.2,1389-C:20.6,1060-D	1.35
PRO+V175	10-V-1234S-A:7.2,1309-C:20.6,1240-D	1.51
PRO+V200A	11-V-1234S-A:7.2,1389-C:20.6,1370-D	1.79
PRO+V200B	8-V-1234S-A:7.2,1894-C:20.6,1060-D	1.83
PRO+V200H	17-V-1234S-A:7.2,897-C:20.6,2080-D	1.83
PRO+V230	10-V-1234S-A:7.2,1779-C:20.6,1240-D	2.03
PRO+V250	11-V-1234S-A:7.2,1894-C:20.6,1310-	2.31
PRO+V250H	17-V-1234S-A:7.2,1144-C:20.6,2080-	2.33
PRO+V270	10-V-1234S-A:7.2,2149-C:20.6,1240-	2.51
PRO+V290	12-V-1234S-A:7.2,1894-C:20.6,1510-	2.72

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

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: 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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