Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S1492 F
	Date of issue	01.08.2013

Company	DIMAS SA Solar Energy Systems	**Country**		Greece
Brand (optional)		**Website**		www.dimas-solar.gr
Street, number	2nd klm, Argos-Nafplion	**E-mail**		info@dimas-solar.gr
Postal Code	21200	**Tel.**	+30	27 510 209 110
City	Argos	**Fax**	+30	2 751 062 671

Collector Type (flat plate / evacuate tubular / un-glazed)	Flat plate collector
Integration in the roof possible ?	No

Collector name	Aperture area (Aa) [m²]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (Ag) [m²]	Power output per collector unit G = 1000 W/m² Tm-Ta : 0 K [W]	10 K [W]	30 K [W]	50 K [W]	70 K [W]
ENERGY + ECO 15	1.36	1 501	1 007	87	1.51	1 006	934	770	580	366
ENERGY + ECO 17*	1.51	1 420	1 183	85	1.68	1 117	1 037	854	644	406
ENERGY + ECO 19*	1.79	1 503	1 305	85	1.96	1 325	1 229	1 013	764	482
ENERGY + ECO 20*	1.83	2 006	1 007	85	2.02	1 354	1 256	1 035	781	493
ENERGY + ECO 23*	2.03	1 893	1 183	85	2.24	1 502	1 394	1 149	866	546
ENERGY + ECO 25	2.31	2 008	1 258	87	2.53	1 709	1 586	1 307	986	622

Collector efficiency parameters related to aperture area (Aa) Type of fluid and flow rate see note 1	η_{0a}	0.740	-
	a_{1a}	5.116	W/(m²K)
	a_{2a}	0.023	W/(m²K²)
Stagnation temperature - Weather conditions see note 2	t_{stg}	130	°C
Effective thermal capacity	$c_{eff} = C/A_a$	13.54	kJ/(m²K)
Max. operation pressure - see note 3	p_{max}	1600	kPa

Incidence angle modifiers $K_\theta(\theta)$	G_{DIF}/G_{TOT} min	G_{DIF}/G_{TOT} max	θ_T / θ_L	50°	*10°*	*20°*	*30°*	*40°*	*60°*	*70°*
			$K_\theta(\theta_T)$	0.93	1.00	0.99	0.98	0.96	0.87	0.75
	-	-	$K_\theta(\theta_L)$	0.93	1.00	0.99	0.98	0.96	0.87	0.75
G_{DIF}/G_{TOT}: min&max - while measuring					***Optional values***					

Testing Laboratory	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number	10COL935/1, 10COL936/1, 10COL936Q/1
Date of test report	01.08.2013
Perf. test method	EN 12975-2 6.1.4 (outdoor)

Comments of testing laboratory :

* dimensions according to manufacturer

Note 1	**Fluid**	Water	**Flow rate**	0.020	kg/s per m²
Note 2	**Irradiance, Gs=1000 W/m²** **Ambient temperature , Ta=30 °C**				
Note 3	**Given by manufacturer**				

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

VERSION 3.6, 2012.01.13

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S1492 F
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Annual collector output kWh

Collector name	Location and collector temperature (Tm)											
	Athens			Davos			Stockholm			Würzburg		
	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 + ECO 15	1 556	926	445	1 161	635	265	814	430	180	891	461	193
ENERGY + ECO 17*	1 728	1 028	494	1 289	705	294	904	477	200	989	512	214
ENERGY + ECO 19*	2 048	1 219	586	1 528	836	349	1 071	566	237	1 173	607	254
ENERGY + ECO 20*	2 094	1 246	599	1 562	854	357	1 095	579	242	1 199	620	260
ENERGY + ECO 23*	2 323	1 382	664	1 733	948	396	1 215	642	269	1 330	688	288
ENERGY + ECO 25	2 643	1 573	756	1 972	1 079	450	1 383	730	306	1 513	783	328

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations

Location	Latitude °	Gtot kWh/m²	Ta °C	Collector orientation or tracking mode
Athens	38	1 765	18.5	South, 25°
Davos	47	1 714	3.2	South, 30°
Stockholm	59	1 166	7.5	South, 45°
Würzburg	50	1 244	9.0	South, 35°

Gtot	Annual total irradiation on collector plane	kWh/m²
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). Detailed description with all equations used is available from the Solar Keymark web site (direct link: http://www.estif.org/solarkeymark/annexb1.php)

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Datasheet version:
VERSION 3.6, 2012.01.13
Calculation program version:
3.07, October 2011 (SP)