Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate		Certificate No.		OEM 9949/2/5
		Date of issue		9/3/2018
Company	ALPHA THERM – PAN. BITZIDIS Co	**Country**		Greece
Brand (optional)		**Website**		www.alphatherm.com.gr
Street, number	Industrial area of Neochorouda	**E-mail**		info@alphatherm.com.gr
Postal Code	57008	**Tel.**	+030	2310 780 271
City	Thessaloniki	**Fax**	+030	2310 780 440
Collector Type (flat plate / evacuate tubular / un-glazed)		Flat plate collector		

Integration in the roof possible ?					Yes					
						Power output per collector unit				
						G = 1000 W/m²				
						Tm-Ta :				
	Aperture area (Aa)	**Gross length**	**Gross width**	**Gross height**	**Gross area (AG)**	0 K	10 K	30 K	50 K	70 K
Collector name	[m²]	[mm]	[mm]	[mm]	[m²]	[W]	[W]	[W]	[W]	[W]
A/T VPLUS 1.50	1,38	1.480	1.010	86	1,50	1.087	1.014	854	674	476
A/T VPLUS 1.82	1,72	1.480	1.230	86	1,82	1.355	1.264	1.064	840	593
A/T VPLUS 2.00	1,86	1.980	1.010	86	2,00	1.466	1.367	1.150	909	642
A/T VPLUS 2.00HOR	1,86	1.010	1.980	86	2,00	1.466	1.367	1.150	909	642
A/T VPLUS 2.37	2,23	1.930	1.230	86	2,37	1.757	1.639	1.379	1.089	769
A/T VPLUS 2.37HOR	2,23	1.230	1.930	86	2,37	1.757	1.639	1.379	1.089	769
A/T VPLUS 2.72	2,57	2.160	1.260	86	2,72	2.025	1.889	1.590	1.255	886
A/T VPLUS 2.72HOR	2,57	1.260	2.160	86	2,72	2.025	1.889	1.590	1.255	886

Collector efficiency parameters related to aperture area (Aa) Note 1	η_{0a}	0,788	-
	a_{1a}	5.140	W/(m²K)
	a_{2a}	0,017	W/(m²K²)
Stagnation temperature - Note 2	tstg	151,9	°C
Effective thermal capacity	Ceff = C/Aa	9,78	kJ/(m²K)
Max. operation pressure - Note 3	pmax	1	Mpa

Incidence angle modifiers $K_\theta(\theta)$	G_{DIF}/G_{TOT}		θ_T / θ_L	50°	*10°*	*20°*	*30°*	*40°*	*60°*	*70°*
	min	max	$K_\theta(\theta_T)$	0,80	*1,00*	*0,99*	*0,98*	*0,97*	*0,90*	*0,81*
	0,1	0,2	$K_\theta(\theta_L)$	0,80	*1,00*	*0,99*	*0,98*	*0,97*	*0,90*	*0,81*
G_{DIF}/G_{TOT}: min&max - while measuring					***Optional values***					

Testing Laboratory	Demokritos
Website	www.solar.demokritos.gr
Test report id. number	4122 DE5, 4123 DQ5, 4125 DE5
Date of test report	7/3/2018
Perf. test method	EN 12975-2 6.1.4 (outdoor/außen/extérieur)

Comments of testing laboratory :

Note 1	**Test conditions**	**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**					

Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +301 6233493-4 , Fax: +301 6233495, http://www.dqshellas.gr, e-mail: ioannisalexiou@dqshellas.gr

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	OEM 9949/2/5
	Issued	9/3/2018

Annual collector output kWh / Jährliche Kollektor Leistung kWh / Energie annuelle produite par le capteur kWh

	Location and collector temperature (Tm)														
	Athens			Davos			Stockholm			Würzburg					
Collector name	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
A/T VPLUS 1.50	1.514	911	479	1.070	628	304	795	441	212	862	467	223			
A/T VPLUS 1.82	1.888	1.136	597	1.334	783	379	991	558	264	1.075	582	278			
A/T VPLUS 2.00	2.041	1.228	645	1.445	847	410	1.071	594	285	1.162	630	300			
A/T VPLUS 2.00HOR	2.041	1.228	645	1.443	847	410	1.071	594	285	1.162	630	300			
A/T VPLUS 2.37	2.447	1.473	774	1.730	1.015	492	1.285	713	342	1.394	755	360			
A/T VPLUS 2.37HOR	2.447	1.473	774	1.730	1.015	492	1.285	713	342	1.394	755	360			
A/T VPLUS 2.72	2.820	1.697	892	1.993	1.170	567	1.480	821	394	1.606	870	413			
A/T VPLUS 2.72HOR	2.820	1.697	892	1.993	1.170	567	1.480	821	394	1.606	870	413			

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 3.4, 30-11-2011
Calculation program version:
3.07 October 2011