


Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate						Licence Number		011-7S660 R							
						Issued		2015-12-15							
Company holding the		Ako Tec Produktionsgesellschaft mbH				Country		Germany							
Brand (optional)		Ako Tec				Website		www.akotec.eu							
Street, street number		Grundmühlenweg 3				E-mail		info@akotec.eu							
Postal Code / City, province		16278 Angermünde		Tel/Fax		49 (0)3331 29 66 88/ (0)3212 12 76 490									
Collector Type (flat plate glazed/un-glazed; evacuate tubular)						Evacuated tubular collector									
Thermal / photo voltaic hybrid collector? (PVT collector)						No									
Integration in the roof possible ? (manufacturers declaration)						No									
						Power output per collector module									
						G = 1000 W/m ²									
						T _m -T _a									
						0 K	10 K	30 K	50 K	70 K					
Collector name						m ²	mm	mm	mm	m ²	W	W	W	W	W
OEM Vario 2400-30 hp						3.05	2 208	2 247	115	4.96	2 144	2 075	1 927	1 767	1 595
OEM Vario 1600-20 hp						2.03	2 208	1 495	115	3.30	1 427	1 381	1 283	1 176	1 061
OEM Vario 800-10 hp						1.02	2 208	745	115	1.64	717	694	644	591	533
OEM Vario 400-5 hp						0.51	2 208	373	115	0.82	359	347	322	295	267
Performance test method						Glazed liquid heating collector - steady state - outdoor									
Performance parameters related to aperture						η ₀	a ₁	a ₂							
Units						-	W/(m ² K)	W/(m ² K ²)							
Test results - Flow rate and fluid see note 1						0.703	2.224	0.005							
Bi-directional incidence angle						Yes <i>K_θ values are obligatory for 50°.</i>									
Incidence angle modifiers K _θ (θT) transversal direction						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Incidence angle modifiers K _θ (θL) longitudinal direction						K _θ (θT)	1.02	1.02	1.02	1.05	1.05	1.00	0.73		0.00
						K _θ (θL)	1.00	1.00	0.99	0.98	0.97	0.94	0.88	0.00	
Stagnation temperature - Weather conditions see note 2						T _{stg}		158		°C					
Effective thermal capacity						c _{eff} = C/Ag		4.14		kJ/(m ² K)					
Max. intended operation temperature - see note 3						T _{max,op}		160		°C					
Max. operation pressure - see note 3						p _{max,op}		1000		kPa					
Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m ² aperture area															
Flow rate		kg/(s m ²)	0.014	0.028	0.042	0.056	0.083	0.111	0.139	0.167					
Pressure drop, ΔP		Pa	133	420	846	1412	2962	5070	7736	10960					
Optional weather data		Location		Link											
Testing Laboratory		TÜV Rheinland Energie und Umwelt GmbH													
Website		www.tuv.com/st													
Test report id. number		21210919_800_10hp; 21210919_2400_30hp				Date of test report		all 2010-07-28							
During the test GDIF/GTOT was always between						0.08	and	0.85							
Comments of testing laboratory:															
*The collector was tested with a black backside sheet to minimize backside reflectivity. The tested collector was build with the so called Narva power tube with backside coating. If the standard tube with only front side coating will be used, the output performance will be the same as for the OEM Vario 2400-30 hp type tested with a black backside sheet. An additional thermal performance test with the collector OEM Vario 3000-30 hp using a high efficiency backside reflector is given on page 3 and 4.															
Note 1	Flow rate	0.033	kg/(s m ²)	Fluid	Water										
Note 2	Irradiance, G = 1000 W/m ² ; Ambient temperature, T _a =30 °C														
Note 3	Given by manufacturer														
 Datashet version: 4.05, 2013-11-07															
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Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S660 R
	Issued	15.12.2015

Annual collector output kWh/module															
Collector name	Location and collector temperature (T _m)														
	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			
OEM Vario 2400-30 hp	3 621	2 937	2 313	2 951	2 357	1 832	2 134	1 636	1 228	2 309	1 770	1 313			
OEM Vario 1600-20 hp	2 410	1 955	1 539	1 964	1 568	1 220	1 421	1 089	817	1 537	1 178	874			
OEM Vario 800-10 hp	1 211	982	773	987	788	613	714	547	411	772	592	439			
OEM Vario 400-5 hp	605	491	387	493	394	306	357	274	205	386	296	220			

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

Overview of locations				
Location	Latitude °	G _{tot} kWh/m ²	T _a °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°

G _{tot}	Annual total irradiation on collector plane	kWh/m ²
T _a	Mean annual ambient air temperature	°C
T _m	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (T_m). A detailed description of the calculations is available at <http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx>.

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OEM Vario 3000-30 hp	4 841	4 188	3 612	4 087	3 515	3 027	2 957	2 466	2 064	3 180	2 650	2 212	
OEM Vario 2000-20 hp	3 201	2 770	2 389	2 703	2 325	2 002	1 955	1 630	1 365	2 103	1 752	1 463	
OEM Vario 1000-10 hp	1 590	1 375	1 186	1 342	1 154	994	971	810	678	1 044	870	726	
OEM Vario 500-5 hp	795	688	593	671	577	497	485	405	339	522	435	363	

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