

Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2059 F
	Date of issue	22-11-2012

Company	Winkler Solar GmbH	Country	Austria
Brand (optional)	Winkler	Website	www.winklersolar.com
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Collector Type (flat plate / evacuate tubular / un-g-lazed)	Flat plate collector
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Integration in the roof possible ?	Yes
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Collector name	Aperture area (Aa) [m ²]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (Ag) [m ²]	Power output per collector unit G = 1000 W/m ² Tm-Ta :				
						0 K	10 K	30 K	50 K	70 K
						[W]	[W]	[W]	[W]	[W]
VarioSol A-antireflex 3x1.25	3,36	1.260	3.030	133	3,82	2.661	2.543	2.272	1.955	1.592
VarioSol A-antireflex 3x1.5	4,08	1.510	3.030	133	4,58	3.223	3.080	2.752	2.368	1.929
VarioSol A-antireflex 2x2	3,67	2.010	2.040	133	4,10	2.899	2.770	2.475	2.130	1.735
VarioSol A-antireflex 3x2	5,50	2.010	3.030	133	6,09	4.348	4.155	3.712	3.194	2.602
VarioSol A-antireflex 2x2.5	4,61	2.510	2.040	133	5,12	3.649	3.487	3.115	2.681	2.184
VarioSol A-antireflex 3x2.5	6,92	2.510	3.030	133	7,61	5.473	5.230	4.672	4.021	3.275
VarioSol A-antireflex 2x3	5,56	3.010	2.040	133	6,14	4.399	4.203	3.755	3.231	2.632
VarioSol A-antireflex 3x3	8,34	3.010	3.030	133	9,12	6.598	6.304	5.632	4.847	3.948
VarioSol E-antireflex 3x1.25	3,33	3.005	1.268	130	3,81	2.632	2.515	2.247	1.933	1.575
VarioSol E-antireflex 3x1.5	4,04	3.005	1.518	130	4,56	3.194	3.052	2.727	2.346	1.911
VarioSol E-antireflex 2x2	3,64	2.015	2.018	130	4,07	2.879	2.751	2.458	2.115	1.723
VarioSol E-antireflex 3x2	5,46	3.005	2.018	130	6,06	4.319	4.127	3.687	3.173	2.584
VarioSol E-antireflex 2x2.5	4,59	2.015	2.518	130	5,07	3.629	3.468	3.098	2.666	2.172
VarioSol E-antireflex 3x2.5	6,88	3.005	2.518	130	7,57	5.444	5.202	4.647	3.999	3.258
VarioSol E-antireflex 2x3	5,54	2.015	3.018	130	6,08	4.379	4.184	3.738	3.217	2.620
VarioSol E-antireflex 3x3	8,30	3.005	3.018	130	9,07	6.568	6.276	5.607	4.825	3.931

Collector efficiency parameters related to aperture area (Aa)	η_{0a}	0,791	-
Type of fluid and flow rate see note 1	a_{1a}	3,348	W/(m ² K)
	a_{2a}	0,017	W/(m ² K ²)

Stagnation temperature - Weather conditions see note 2	t_{stg}	195,4	°C
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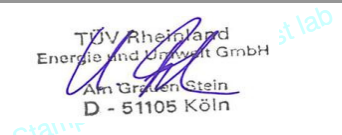
Effective thermal capacity	$C_{eff} = C/Aa$	5,64	kJ/(m ² K)
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Max. operation pressure - see note 3	p_{max}	600	kPa
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Incidence angle modifiers $K_{\theta}(\theta)$	G_{DIF}/G_{TOT}		θ_T / θ_L	50°	10°	20°	30°	40°	60°	70°
	min	max	$K_{\theta}(\theta_T)$	0,90	1,00	0,99	0,97	0,94	0,81	0,64
			$K_{\theta}(\theta_L)$	0,90	1,00	0,99	0,97	0,94	0,81	0,64
G_{DIF}/G_{TOT} : min&max - while measuring				Optional values						

Testing Laboratory	TÜV Energie und Umwelt GmbH
Website	www.eco-tuv.de
Test report id. number	21220066_EN_R; 21220066_EN_P1; 21220066_EN_P2
Date of test report	22.11.2012; 22.11.2012, 22.11.2012
Perf. test method	EN 12975-2 6.1.5 (indoor)

Comments of testing laboratory :	
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Note 1	Fluid	Water	Flow rate	0,026 kg/s per m ²	
Note 2	Irradiance, G_s=1000 W/m²				
Note 3	Given by manufacturer				

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2059 F
	Issued	22-11-2012

Annual collector output kWh														
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		
VarioSol A-antireflex 3x1.25	4.087	2.950	1.927	3.360	2.325	1.440	2.301	1.527	923	2.495	1.639	976		
VarioSol A-antireflex 3x1.5	4.951	3.573	2.334	4.071	2.817	1.744	2.788	1.849	1.119	3.022	1.986	1.182		
VarioSol A-antireflex 2x2	4.453	3.214	2.099	3.661	2.533	1.568	2.507	1.663	1.006	2.718	1.786	1.063		
VarioSol A-antireflex 3x2	6.679	4.820	3.149	5.491	3.800	2.352	3.760	2.495	1.509	4.076	2.679	1.595		
VarioSol A-antireflex 2x2.5	5.605	4.045	2.643	4.608	3.189	1.974	3.156	2.094	1.266	3.421	2.248	1.338		
VarioSol A-antireflex 3x2.5	8.407	6.067	3.963	6.912	4.782	2.961	4.733	3.140	1.899	5.131	3.372	2.007		
VarioSol A-antireflex 2x3	6.757	4.876	3.186	5.555	3.844	2.380	3.804	2.524	1.526	4.124	2.710	1.613		
VarioSol A-antireflex 3x3	10.135	7.314	4.778	8.332	5.765	3.569	5.706	3.785	2.290	6.185	4.065	2.420		
VarioSol E-antireflex 3x1.25	4.043	2.917	1.906	3.324	2.300	1.424	2.276	1.510	913	2.467	1.621	965		
VarioSol E-antireflex 3x1.5	4.906	3.541	2.313	4.034	2.791	1.728	2.762	1.833	1.108	2.994	1.968	1.172		
VarioSol E-antireflex 2x2	4.423	3.192	2.085	3.636	2.516	1.558	2.490	1.652	999	2.699	1.774	1.056		
VarioSol E-antireflex 3x2	6.634	4.788	3.128	5.454	3.774	2.336	3.735	2.478	1.499	4.049	2.661	1.584		
VarioSol E-antireflex 2x2.5	5.575	4.023	2.628	4.583	3.171	1.963	3.139	2.082	1.259	3.402	2.236	1.331		
VarioSol E-antireflex 3x2.5	8.362	6.034	3.942	6.875	4.757	2.945	4.708	3.123	1.889	5.103	3.354	1.997		
VarioSol E-antireflex 2x3	6.727	4.854	3.171	5.530	3.827	2.369	3.787	2.512	1.520	4.105	2.698	1.606		
VarioSol E-antireflex 3x3	10.090	7.281	4.757	8.295	5.740	3.553	5.681	3.769	2.279	6.158	4.047	2.409		

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	Gtot 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°

Gtot	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

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 (T_m). 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 3.5, 2012.01.13
Calculation program version:
3.07, October 2011 (SP)