





Annex to Solar Keymark Certificate					Licence Number		011-7S2640 R							
Summary of EN ISO 9806 Test Results					Issued		2016-03-16							
Collector test standard			EN ISO 9806											
Licence holder			Olymp Werk GmbH			Country		Austria						
Brand (optional)			-			Web		www.olymp.at						
Street, Number			Olympstrasse 10			E-mail		office@olymp.at						
Postcode, City			AT-6430 Ötztal-Bahnhof			Tel		+43 5266 8910 0						
Collector Type					Evacuated tubular collector									
					Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup>									
					∅ <sub>m</sub> - ∅ <sub>a</sub>									
Collector name					Gross area (A <sub>G</sub> )	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	134 K
					m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
Sunstar 0870					1.41	2'285	615	134	846	829	791	749	703	524
Sunstar 1670					2.78	2'285	1'215	134	1'668	1'634	1'560	1'478	1'386	1'032
Sunstar 2470					4.15	2'285	1'815	134	2'490	2'440	2'329	2'206	2'069	1'541
Power output per m <sup>2</sup> gross area					600	588	561	532	499	371				
Performance parameters test method			Steady state - outdoor											
Performance parameters (related to AG)			η <sub>0,hem</sub>	a <sub>1</sub>	a <sub>2</sub>									
Units			-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )									
Test results			0.600	1.170	0.004									
Incidence angle modifier test method			Steady state - outdoor											
Bi-directional incidence angle modifiers			Yes											
Incidence angle modifier			Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°		
Transversal			K <sub>θT, coll</sub>	1.01	1.03	1.05	1.04	1.01	0.95	0.85	0.50	0.00		
Longitudinal			K <sub>θL, coll</sub>	1.00	1.00	0.99	0.97	0.93	0.85	0.71	0.46	0.00		
Fluid for testing					Water-Glycole									
Flow rate for testing (per gross area, AG)					dm/dt	0.021		kg/(sm <sup>2</sup> )						
Maximum temperature difference for thermal performance calculations					(∅ <sub>m</sub> -∅ <sub>a</sub> ) <sub>max</sub>	134		K						
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ∅ <sub>a</sub> = 30 °C)					∅ <sub>stg</sub>	269		°C						
Effective thermal capacity (per gross area, AG)					C/m <sup>2</sup>	2.78		kJ/(Km <sup>2</sup> )						
Maximum operating temperature					∅ <sub>max, op</sub>	140		°C						
Maximum operating pressure					p <sub>max, op</sub>	600		kPa						
Testing laboratory			SPF, CH-8640 Rapperswil			www.solarenergy.ch								
Test report(s)			C1690LPEN C1691LPEN C1691QPEN			Dated		14.03.2016 14.03.2016 14.03.2016						
Comments of testing laboratory														
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						 INSTITUT FÜR SOLARTECHNIK 								



Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2640 R
	Issued	2016-03-16

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$ , based on ISO 9806 Test Results													
Collector name	Standard Locations $\vartheta_m$	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
Sunstar 0870		1'437	1'256	1'074	1'224	1'053	889	879	736	604	945	792	649
Sunstar 1670		2'833	2'477	2'117	2'414	2'076	1'753	1'733	1'450	1'191	1'864	1'561	1'280
Sunstar 2470		4'229	3'698	3'160	3'604	3'099	2'617	2'587	2'165	1'777	2'783	2'331	1'911
Annual output per m <sup>2</sup> gross area		1'019	891	762	868	747	631	623	522	428	671	562	460
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 kWh/m <sup>2</sup>			1166 kWh/m <sup>2</sup>			1244 kWh/m <sup>2</sup>		
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 $\vartheta_m$ (mean of in- and outlet temperatures). The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool Scenocalc Ver. 5.01 (July 2015). A detailed description of the calculations is available at <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													

Additional Information		
Collector heat transfer medium	Liquid	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806 under the following conditions:		
Climate class (A, B or C)	A	--
Positive Mechanical Load	1000	Pa
Negative Mechanical Load	1000	Pa
Hail resistance using ice balls (diameter)	25	mm

Energy Labelling Information			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Sunstar 0870	1.41	Collector efficiency ( $\eta_{col}$ )	55 %
Sunstar 1670	2.78	Remark: Collector efficiency ( $\eta_{col}$ ) 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/m <sup>2</sup> , expressed in % and rounded to the nearest integer. Deviating from the regulation $\eta_{col}$ is based on reference area ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806.	
Sunstar 2470	4.15		
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0.600 --
		First-order coefficient ( $a_1$ )	1.17 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.040 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	1.01 --
		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.	