



Annex to Solar Keymark Certificate					Licence Number		011-7S630 F								
					Date issued		2020-01-13								
					Issued by		TÜV Rheinland Energy GmbH								
Licence holder		Winkler Solar GmbH			Country		Austria								
Brand (optional)					Web		www.winklersolar.com								
Street, Number		Räterweg 17			E-mail		solar@winklersolar.com								
Postcode, City		A-6800 Feldkirch			Tel		+43 552 276 139								
Collector Type					Flat plate collector										
Collector name					Power output per collector										
					$G_b = 850 \text{ W/m}^2$, $G_d = 150 \text{ W/m}^2$ & $u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$										
					Gross area (A_G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	100 K	
					m ²	mm	mm	mm	W	W	W	W	W	W	
VarioSol E 2x2 m					4.06	2 015	2 015	130	2 856	2 724	2 429	2 092	1 712	1 063	
Power output per m² gross area					703	671	598	515	422	262					
Performance parameters test method					Quasi dynamic										
Performance parameters (related to A_G)					$\eta_{0, b}$	a1	a2	a3	a4	a5	a6	a7	a8	Kd	
Units					-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-	
Test results					0.713	3.12	0.013	0.000	0.00	8 948	0.000	0.00	0.0E+00	0.91	
Incidence angle modifier test method					Quasi dynamic - outdoor										
Incidence angle modifier					Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal					$K_{\theta T, coll}$	1.00	0.99	0.98	0.95	0.91	0.84	0.68	0.34	0.00	
Longitudinal					$K_{\theta L, coll}$	1.00	0.99	0.98	0.95	0.91	0.84	0.68	0.34	0.00	
Heat transfer medium for testing					Water										
Flow rate for testing (per gross area, A_G)					dm/dt		0.026		kg/(sm ²)						
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		70		K						
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ °C}$)					ϑ_{stg}		210		°C						
Maximum operating temperature					$\vartheta_{max, op}$		n.n.		°C						
Maximum operating pressure					$p_{max, op}$		600		kPa						
Testing laboratory					TÜV Rheinland Energy GmbH					www.tuv.com/solar					
Test report(s)					21244769.002					Dated		13.01.2020			
Comments of testing laboratory					Datasheet version: 6.1, 2019-09-26 Die kundenspezifisch gefertigte Kollektorserie VarioSol beinhaltet die Standardmodule im Höhenraster von 1/ 1,25/ 1,5/ 2/ 2,5/ 3 m sowie Breitenraster von 2/ 3...8 m mit einer Bruttofläche von 3.75 bis 24 m ² sowie auch Sonderbauformen, sämtliche Zwischengrößen und Sonderabmessungen.										
					 TÜVRheinland® Genuß. Risikofrei. TÜV Rheinland Energy GmbH Am Grauen Stein 51109 Köln										
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de															

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Supplementary Information						Issued		2020-01-13									
Annual collector output in kWh/collector at mean fluid temperature ϑ_m																	
Standard Locations		Athens			Davos			Stockholm			Würzburg						
Collector name	ϑ_m	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 E 2x2 m		4 517	3 260	2 147	3 457	2 409	1 522	2 539	1 680	1 024	2 762	1 816	1 089				
Annual output per m ² gross area		1 113	803	529	851	593	375	625	414	252	680	447	268				
Annual efficiency, η_a		63%	45%	30%	52%	36%	23%	54%	35%	22%	55%	36%	22%				
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)															
Annual irradiation on collector plane		1765 kWh/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²						
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 ϑ_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. 6.1 (September 2019). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/																	
Additional Information																	
Collector heat transfer medium										Water-Glycole							
The collector is deemed to be suitable for roof integration										Yes							
The collector was tested successfully under the following conditions:																	
Climate class (A+, A, B or C)										A		--					
G (W/m ²) >		1000		ϑ_a (°C) >		20		H_x (MJ/m ²) >		600							
Maximum tested positive load										3000		Pa					
Maximum tested negative load										2400		Pa					
Hail resistance using steel ball (maximum drop height)										-		m					
Additional collector attribute(s)																	
<input type="checkbox"/> Using external power source(s) for normal operation					<input type="checkbox"/> Active or passive measure(s) for self-protection												
<input type="checkbox"/> Co-generating thermal and electrical power					<input checked="" type="checkbox"/> Façade collector(s)												
Energy Labelling Information						Additional Informative Technical Data											
Reference Area, A_{sol} (m ²)						Hydraulic Designation Code				Aperture Area, A_a (m ²)							
VarioSol E 2x2 m						4,4,5,5-H-23R-A:7.0,1860-C:20.6,2050				3.64							
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}						Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}											
Collector efficiency (η_{col})						56%				Zero-loss efficiency (η_0)				0.70		--	
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{col} is based on reference area (A_{sol}) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.						First-order coefficient (a_1)				3.12				W/(m ² K)			
						Second-order coefficient (a_2)				0.013				W/(m ² K ²)			
						Incidence angle modifier IAM (50°)				0.90				--			
						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.											
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