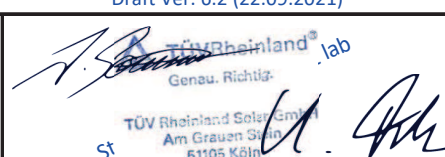


Annex to Solar Keymark Certificate					Licence Number		011-7S3125 F							
					Date issued		2023-11-21							
					Issued by		DINCertco							
Licence holder		W.S.E. GmbH			Country		Austria							
Brand (optional)		WSOLARENERGIE			Web		www.wsolarenergie.com							
Street, Number		Räterweg 17			E-mail		info@wsolarenergie.com							
Postcode, City		A-6800 Feldkirch			Tel		+43 55 22 76 139-23							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					Gb = 850 W/m <sup>2</sup> , Gd = 150 W/m <sup>2</sup> & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	110 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm			
					W	W	W	W	W	W				
Metrosol 20 V					2.01	1 675	1 200	50	1 451	1 365	1 180	980	763	281
Metrosol 20 H					2.01	1 200	1 675	50	1 451	1 365	1 180	980	763	281
Metrosol 25 V					2.51	2 090	1 200	55	1 812	1 705	1 474	1 223	953	351
Metrosol 25 H					2.51	1 200	2 090	55	1 812	1 705	1 474	1 223	953	351
Power output per m <sup>2</sup> gross area					722	679	587	487	380	140				
Performance parameters test method		Steady state - indoor												
Performance parameters (related to A <sub>G</sub> )		$\eta_{0, b}$	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	J/(m <sup>2</sup> K)	s/m	W/(m <sup>2</sup> K <sup>4</sup> )	W/(m <sup>2</sup> K <sup>4</sup> )	-			
Test results		0.728	4.19	0.010	0.000	0.00	6 553	0.000	0.00	0.0E+00	0.95			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K <sub>GT, coll</sub>	1.00	0.99	0.97	0.95	0.90	0.82	0.65	0.33	0.00			
Longitudinal		K <sub>GL, coll</sub>	1.00	0.99	0.97	0.95	0.90	0.82	0.65	0.33	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A <sub>G</sub> )					dm/dt	0.023	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test					( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	80	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30$ °C)					$\vartheta_{stg}$	200	°C							
Maximum operating temperature					$\vartheta_{max, op}$	200	°C							
Maximum operating pressure					p <sub>max, op</sub>	600	kPa							
Testing laboratory		TÜV Rheinland Solar GmbH			www.tuv.com/solar									
Test report(s)		DE23KTBK 001 DE23G9LG 001 DE23K8QN 001 (Doc-check)			Dated		04.07.2023 28.08.2023 21.11.2023							
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
														
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Annex to Solar Keymark Certificate						Licence Number			011-7S3125 F						
Supplementary Information						Issued			2023-11-21						
Gross Thermal Yield in kWh/collector at mean fluid temperature $\vartheta_m$															
Standard Locations		Athens			Davos			Stockholm			Würzburg				
Collector name	$\vartheta_m$	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C		
Metrosol 20 V		2 286	1 521	915	1 668	1 075	616	1 239	752	419	1 357	813	443		
Metrosol 20 H		2 286	1 521	915	1 668	1 075	616	1 239	752	419	1 357	813	443		
Metrosol 25 V		2 855	1 899	1 142	2 083	1 342	770	1 547	939	523	1 694	1 016	554		
Metrosol 25 H		2 855	1 899	1 142	2 083	1 342	770	1 547	939	523	1 694	1 016	554		
Gross Thermal Yield per m <sup>2</sup> gross area		1 137	757	455	830	535	307	616	374	208	675	405	221		
Annual efficiency, $\eta_a$		64%	43%	26%	51%	33%	19%	53%	32%	18%	54%	33%	18%		
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)													
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1630 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 Draft Ver. 6.2 (22.09.2021). A detailed description of the calculations is available at <a href="http://www.estif.org/solarkeymarknew/">http://www.estif.org/solarkeymarknew/</a>															
<b>Additional Information</b>															
Collector heat transfer medium										Water-Glycole					
The collector is deemed to be suitable for roof integration										No					
The collector was tested successfully under the following conditions:															
Climate class (A+, A, B or C)										A		--			
G (W/m <sup>2</sup> ) >		1000		$\vartheta_a$ (°C) >		20		H <sub>x</sub> (MJ/m <sup>2</sup> ) >		600					
Maximum tested positive load										2000		Pa			
Maximum tested negative load										1750		Pa			
Hail resistance using ice balls (diameter)										35		mm			
<b>Additional collector attribute(s)</b>															
Using external power source(s) for normal operation										No		Active or passive measure(s) for self-protection		No	
Co-generating thermal and electrical power										No		Façade collector(s)		No	
<b>Energy Labelling Information</b>						<b>Additional Informative Technical Data</b>									
						Reference Area, A <sub>sol</sub> (m <sup>2</sup> )		Hydraulic Designation Code			Aperture Area, A <sub>a</sub> (m <sup>2</sup> )				
Metrosol 20 V						2.01		1-H-12345-A:9.2,14800-C:20.6,1130			1.87				
Metrosol 20 H						2.01		1-H-12345-A:9.2,15200-C:20.6,1625			1.87				
Metrosol 25 V						2.51		1-H-12345-A:9.2,19700-C:20.6,1130			2.35				
Metrosol 25 H						2.51		1-H-12345-A:9.2,18900-C:20.6,2020			2.35				
<b>Data required for CDR (EU) No 811/2013 - Reference Area A<sub>sol</sub></b>						<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>									
Collector efficiency ( $\eta_{col}$ )						54%		Zero-loss efficiency ( $\eta_0$ )			0.72		--		
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 <sub>sol</sub> ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.						First-order coefficient (a <sub>1</sub> )			4.19			W/(m <sup>2</sup> K)			
						Second-order coefficient (a <sub>2</sub> )			0.010			W/(m <sup>2</sup> K <sup>2</sup> )			
						Incidence angle modifier IAM (50°)			0.91			--			
						Remark: The data given in this section are related to collector reference area (A <sub>sol</sub> ) 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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