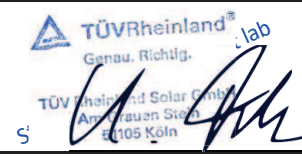


Annex to Solar Keymark Certificate					Licence Number		011-7S3151 F							
					Date issued		2024-04-23							
					Issued by		DINCERTCO							
Licence holder		Windhager Zentralheizung Technik GmbH			Country		Austria							
Brand (optional)		-			Web		http://www.windhager.com							
Street, Number		Street Anton-Windhager Straße 20			E-mail		info@at.windhager.com							
Postcode, City		5201 Seekirchen am Wallersee			Tel		+43 664 8277578							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	100 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm			
SolarWIN Premium					2.25	2 100	1 070	105	1 595	1 522	1 357	1 166	950	579
Power output per m <sup>2</sup> gross area					709	676	603	518	422	257				
Performance parameters test method		Quasi dynamic												
Performance parameters (related to A <sub>G</sub> )		η <sub>0</sub> , 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		0.716	3.12	0.014	0.000	0.00	6 600	0.000	0.00	0.0E+00	0.94			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K <sub>θT, coll</sub>	1.00	0.99	0.98	0.97	0.94	0.89	0.78	0.45	0.00			
Longitudinal		K <sub>θL, coll</sub>	1.00	0.99	0.98	0.97	0.94	0.89	0.78	0.45	0.00			
Heat transfer medium for testing		Water												
Flow rate for testing (per gross area, A <sub>G</sub> )		dm/dt		0.043		kg/(sm <sup>2</sup> )								
Maximum temperature difference during thermal performance test		(ϑ <sub>m</sub> -ϑ <sub>a</sub> ) <sub>max</sub>		70		K								
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ϑ <sub>a</sub> = 30 °C)		ϑ <sub>stg</sub>		200		°C								
Maximum operating temperature		ϑ <sub>max, op</sub>		200		°C								
Maximum operating pressure		p <sub>max, op</sub>		1000		kPa								
Testing laboratory		TÜV Rheinland Energy GmbH					http://www.tuv.com/solar							
Test report(s)		21242669.001rev1 21242669.003rev1 DE23UR0T.001 (Doc-check)					Dated		28.01.2019 28.01.2019 07.03.2023					
Comments of testing laboratory		Ver. 6.2 (13.01.2022)												
														
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														

<b>Annex to Solar Keymark Certificate</b>											<b>Licence Number</b>			<b>011-7S3151 F</b>		
<b>Supplementary Information</b>											<b>Issued</b>			<b>2024-04-23</b>		
<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>																
<b>Standard Locations</b>		<b>Athens</b>			<b>Davos</b>			<b>Stockholm</b>			<b>Würzburg</b>					
<b>Collector name</b>	<b>info@at.v. <math>\vartheta_m</math></b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>	<b>25°C</b>	<b>50°C</b>	<b>75°C</b>			
SolarWIN Premium		1 576	1 039	619	1 576	1 039	619	1 576	1 039	619	1 576	1 039	619			
Gross Thermal Yield per m <sup>2</sup> gross area		701	462	275	701	462	275	701	462	275	701	462	275			
Annual efficiency, $\eta_a$		40%	26%	16%	43%	28%	17%	60%	40%	24%	56%	37%	22%			
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 Ver. 6.2 (13.01.2022). 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											Yes					
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											5400		Pa			
Maximum tested negative load											1000		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> )					
SolarWIN Premium							2.25				9-VH-12S-A:7.3,1930-C:20.8,2010			2.01		
<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 ( $\eta_{col}$ )							56%									
Zero-loss efficiency ( $\eta_0$ )							0.71		--							
First-order coefficient (a <sub>1</sub> )							3.12		W/(m <sup>2</sup> K)							
Second-order coefficient (a <sub>2</sub> )							0.014		W/(m <sup>2</sup> K <sup>2</sup> )							
Incidence angle modifier IAM (50°)							0.94		--							
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.							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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