

<b>Annex to Solar Keymark Certificate</b>				<b>Licence Number</b>		<b>011-7S3199 F</b>					
				<b>Date issued</b>		<b>2023-08-28</b>					
				<b>Issued by</b>		<b>DIN CERTCO</b>					
<b>Licence holder</b>		<b>Zantia Climatização SA</b>				<b>Country</b>		<b>Portugal</b>			
<b>Brand (optional)</b>						<b>Web</b>		<a href="http://www.zantia.com">http://www.zantia.com</a>			
<b>Street, Number</b>		<b>Zona Industrial de Mundão, Lote 10-A</b>				<b>E-mail</b>		<a href="mailto:rui.margues@zantia.com">rui.margues@zantia.com</a>			
<b>Postcode, City</b>		<b>3505-459 Viseu</b>				<b>Tel</b>		<b>+351 232 439 010</b>			
<b>Collector Type</b>						<b>Flat plate collector</b>					
<b>Collector name</b>					<b>Power output per collector</b>						
					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	138 K	
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm
<b>ZHS200 Neo</b>					<b>1.76</b>	<b>1'916</b>	<b>916</b>	<b>92</b>	<b>1'252</b>	<b>1'192</b>	<b>1'060</b>
<b>ZHS250 Neo</b>					<b>2.31</b>	<b>1'961</b>	<b>1'176</b>	<b>92</b>	<b>1'644</b>	<b>1'564</b>	<b>1'392</b>
<b>Power output per m<sup>2</sup> gross area</b>					<b>712</b>	<b>677</b>	<b>602</b>	<b>521</b>	<b>432</b>	<b>75</b>	
<b>Performance parameters test method</b>		<b>Quasi dynamic</b>									
<b>Performance parameters (related to A<sub>G</sub>)</b>		$\eta_0, b$	a1	a2	a3	a4	a5	a6	a7	a8	Kd
<b>Units</b>		-	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> )	-
<b>Test results</b>		<b>0.713</b>	<b>3.37</b>	<b>0.009</b>	<b>0.000</b>	<b>0.00</b>	<b>13'380</b>	<b>0.000</b>	<b>0.00</b>	<b>0.00</b>	<b>0.99</b>
<b>Incidence angle modifier test method</b>		<b>Quasi dynamic - outdoor</b>									
<b>Incidence angle modifier</b>		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
<b>Transversal</b>		K <sub>θT, coll</sub>	1.00	1.00	0.99	0.98	0.92	0.74	0.50	0.25	0.00
<b>Longitudinal</b>		K <sub>θL, coll</sub>	1.00	1.00	0.99	0.98	0.92	0.74	0.50	0.25	0.00
<b>Heat transfer medium for testing</b>						<b>Water-Glycole</b>					
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>						dm/dt		0.020	kg/(sm <sup>2</sup> )		
<b>Maximum temperature difference during thermal performance test</b>						$(\vartheta_m - \vartheta_a)_{max}$		108	K		
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30^\circ\text{C}</math>)</b>						$\vartheta_{stg}$		201	°C		
<b>Maximum operating temperature</b>						$\vartheta_{max, op}$		100	°C		
<b>Maximum operating pressure</b>						p <sub>max, op</sub>		1000	kPa		
<b>Testing laboratory</b>		<b>Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)</b>					<a href="http://www.igte.uni-stuttgart.de">http://www.igte.uni-stuttgart.de</a>				
<b>Test report(s)</b>		17COL1400OEM03 17COL1401OEM03 17COL1401QOEM03					<b>Dated</b>		09.08.2023 09.08.2023 09.08.2023		
<b>Comments of testing laboratory</b>						<b>Ver. 6.2 (13.01.2022)</b>					
Documented performance parameters are taken from 17COL1400OEM03 (ZHS200 Neo)						<i>Stamp &amp; signature of test lab</i>					
<b>DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany</b> <b>Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de</b>											

<b>Annex to Solar Keymark Certificate</b>												<b>Licence Number</b>			<b>011-7S3199 F</b>			
<b>Supplementary Information</b>												<b>Issued</b>			<b>2023-08-28</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><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>					
ZHS200 Neo		2'022	1'457	976	1'545	1'085	709	1'128	750	470	1'235	815	503					
ZHS250 Neo		2'654	1'912	1'282	2'028	1'424	930	1'481	984	616	1'621	1'070	660					
Gross Thermal Yield per m <sup>2</sup> gross area		1'149	828	555	878	617	403	641	426	267	702	463	286					
Annual efficiency, $\eta_a$		65%	47%	31%	54%	38%	25%	55%	37%	23%	56%	37%	23%					
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												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												2750		Pa				
Maximum tested negative load												2500		Pa				
Hail resistance using steel ball (maximum drop height)												2		m				
<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> )						
ZHS200 Neo						8-V-1234S-7.2,1780-20.6,921-D						1.71						
ZHS250 Neo						10-V-1234S-7.2,1828-20.6,1181-D						2.25						
<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 ( $\eta_{col}$ )						Zero-loss efficiency ( $\eta_0$ )						0.71			--			
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> )						3.37			W/(m <sup>2</sup> K)			
						Second-order coefficient (a <sub>2</sub> )						0.009						W/(m <sup>2</sup> K <sup>2</sup> )
						Incidence angle modifier IAM (50°)						0.96						--
						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.												
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany																		
Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: <a href="mailto:info@dincertco.de">info@dincertco.de</a> • <a href="http://www.dincertco.de">www.dincertco.de</a>																		