


<b>Annex to Solar Keymark Certificate</b>					<b>Licence Number</b>		<b>011-7S3263 F</b>							
					<b>Date issued</b>		<b>2024-09-25</b>							
					<b>Issued by</b>		<b>DINCERTCO</b>							
<b>Licence holder</b>		<b>STAR NEGOCE ENERGIES</b>			<b>Country</b>		France							
<b>Brand (optional)</b>		ATECHE			<b>Web</b>		<a href="https://www.starnegoce-energies.com/">https://www.starnegoce-energies.com/</a>							
<b>Street, Number</b>		13 Avenue de Lacanau			<b>E-mail</b>		semih.ozyurt@starnegoce-energies.com							
<b>Postcode, City</b>		13700 Marignane			<b>Tel</b>		+33 6 95 84 47 29							
<b>Collector Type</b>					Flat plate collector									
<b>Collector name</b>					<b>Power output per collector</b>									
					G <sub>b</sub> = 850 W/m <sup>2</sup> , G <sub>d</sub> = 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	113 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm	mm			
<b>CST 180</b>					1.79	1 927	927	90	1 249	1 182	1 036	876	702	279
<b>CST 200</b>					2.07	1 988	1 041	90	1 445	1 367	1 198	1 013	812	323
<b>CST 300</b>					2.42	1 988	1 218	90	1 689	1 598	1 401	1 185	949	378
<b>Power output per m<sup>2</sup> gross area</b>					698	660	579	490	392	156				
<b>Performance parameters test method</b>		Quasi dynamic												
<b>Performance parameters (related to A<sub>G</sub>)</b>		η <sub>0</sub> , 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>		0.703	3.67	0.010	0.000	0.00	10 210	0.000	0.00	0.0	0.95			
<b>Incidence angle modifier test method</b>		Quasi dynamic - outdoor												
<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	0.97	0.88	0.75	0.55	0.28	0.00			
<b>Longitudinal</b>		K <sub>θL, coll</sub>	1.00	1.00	0.99	0.97	0.88	0.75	0.55	0.28	0.00			
<b>Heat transfer medium for testing</b>		Water												
<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>		( $\vartheta_m - \vartheta_a$ ) <sub>max</sub>	83	K										
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30</math> °C)</b>		$\vartheta_{stg}$	210	°C										
<b>Maximum operating temperature</b>		$\vartheta_{max, op}$	120	°C										
<b>Maximum operating pressure</b>		p <sub>max, op</sub>	1000	kPa										
<b>Testing laboratory</b>		Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)						<a href="http://www.igte.uni-stuttgart.de">http://www.igte.uni-stuttgart.de</a>						
<b>Test report(s)</b>		23COL1736OEM01 23COL1737OEM01 23COL1737QOEM01						<b>Dated</b>		19.08.2024 19.08.2024 19.08.2024				
<b>Comments of testing laboratory</b>		Documented performance parameters are taken from 23COL1736OEM01 (CST180). This SK data sheet replaces the SK data sheet dated 2024-09-03. The reason for the replacement is that the collector names for C180 and C300 did not match in the previous version.						Ver. 6.2 (13.01.2022)						
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<b>Annex to Solar Keymark Certificate Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S3263 F</b>
	<b>Issued</b>	<b>2024-09-25</b>

<b>Gross Thermal Yield in kWh/collector at mean fluid temperature <math>\vartheta_m</math></b>													
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
CST 180		1 982	1 370	868	1 482	996	609	1 088	690	407	1 191	748	432
CST 200		2 291	1 584	1 004	1 713	1 152	704	1 259	798	470	1 378	865	500
CST 300		2 679	1 852	1 174	2 003	1 347	823	1 472	933	550	1 611	1 011	585
Gross Thermal Yield per m <sup>2</sup> gross area		1 107	765	485	828	556	340	608	385	227	666	418	242
Annual efficiency, $\eta_a$		63%	43%	27%	51%	34%	21%	52%	33%	19%	53%	34%	19%
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 <http://www.estif.org/solarkeymarknew/>

<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
		$H_x$ (MJ/m <sup>2</sup> ) >	600
Maximum tested positive load	3000		Pa
Maximum tested negative load	2400		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, $A_{sol}$ (m <sup>2</sup> )	Hydraulic Designation Code	Aperture Area, $A_a$ (m <sup>2</sup> )
CST 180	1.79	8-V-1234S-7.1,1839-16.6,973-D	1.62
CST 200	2.07	9-V-1234S-7.1,1900-16.6,1087-D	1.93
CST 300	2.42	10-V-1234S-7.1,1900-16.6,1264-D	2.23

<b>Data required for CDR (EU) No 811/2013 - Reference Area <math>A_{sol}</math></b>		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>	
Collector efficiency ( $\eta_{col}$ )	54%	Zero-loss efficiency ( $\eta_0$ )	0.70
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 9806:2017.		First-order coefficient ( $a_1$ )	3.67
		Second-order coefficient ( $a_2$ )	0.010
		Incidence angle modifier IAM (50°)	0.94
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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.