

Annex to Solar Keymark Certificate						Licence Number		011-7S734 F								
						Date issued		2019-11-08								
						Issued by		ISFH CalTeC								
Licence holder			tecalor GmbH & Co. KG			Country		Germany								
Brand (optional)						Web		<a href="http://www.tecalor.de">http://www.tecalor.de</a>								
Street, Number			Fürstenberger Straße 77			E-mail		<a href="mailto:info@tecalor.de">info@tecalor.de</a>								
Postcode, City			D- 37603 Holzminden			Tel		+49 55 31 - 99068-95082								
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	86 K					
						W	W	W	W	W	W					
<b>TSK 27 basic</b>						93	2.53	2,168	1,168	2.39	1,871	1,782	1,587	1,367	1,123	911
Power output per m <sup>2</sup> gross area						739	704	627	540	444	360					
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						0.753	3.38	0.012			4,500				0.88	
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	0.96	0.92	0.86	0.73	0.32	0.00	
Longitudinal						K <sub>θL, coll</sub>	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.32	0.00	
Heat transfer medium for testing						Water-Glycole										
Flow rate for testing (per gross area, A <sub>G</sub> )						dm/dt		0.033	kg/(sm <sup>2</sup> )							
Maximum temperature difference during thermal performance test						$(\vartheta_m - \vartheta_a)_{max}$		56	K							
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; $\vartheta_a = 30^{\circ}\text{C}$ )						$\vartheta_{stg}$		210	°C							
Maximum operating temperature						$\vartheta_{max, op}$		100	°C							
Maximum operating pressure						p <sub>max, op</sub>		600	kPa							
Testing laboratory			Institut für Solarenergieforschung GmbH			Dated			11.10.2019							
Test report(s)			28-19/K													
Comments of testing laboratory						Datasheet version: 6.0, 2018-10-30										
						Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31860 Emmerthal Tel.: 05151/999-100 Fax: 05151/999-500										
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<b>Supplementary Information</b>		<b>Issued</b>		<b>2019-11-08</b>									
<b>Annual collector output 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>	$\vartheta_m$	<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>
TSK 27 basic		2,941	2,110	1,392	2,245	1,565	997	1,648	1,089	667	1,790	1,173	708
Annual output per m <sup>2</sup> gross area		1,162	834	550	887	618	394	651	430	264	708	464	280
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m <sup>2</sup>			1714 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. 6.0 (October 2018). A detailed description of the calculations is available at <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</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											3000		Pa
Maximum tested negative load											1859		Pa
Hail resistance using steel ball (maximum drop height)											1.8		m
<b>Additional collector attribute(s)</b>													
<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 type="checkbox"/> Wind and/or infrared sensitive collector(s) (WISC)									
<input type="checkbox"/> Façade collector(s)													
<b>Energy Labelling Information</b>													
		Reference Area, A <sub>sol</sub> (m <sup>2</sup> )			Hydraulic Designation Code								
TSK 27 basic		2.53			5,5-V-12S-A:7.3,2084-C:16.8,1071								
<b>Data required for CDR (EU) No 811/2013 - Reference Area</b>				<b>Data required for CDR (EU) No 812/2013 - Reference Area A<sub>sol</sub></b>									
Collector efficiency ( $\eta_{col}$ )				59%			Zero-loss efficiency ( $\eta_0$ )			0.74		--	
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> )			3.38		W/(m <sup>2</sup> K)				
				Second-order coefficient (a <sub>2</sub> )			0.012		W/(m <sup>2</sup> K <sup>2</sup> )				
				Incidence angle modifier IAM (50°)			0.92		--				
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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