


<b>Annex to Solar Keymark Certificate</b>						<b>Licence Number</b>		<b>011-7S842 F</b>																	
						<b>Date issued</b>		<b>2019-08-07</b>																	
						<b>Issued by</b>		<b>DIN CERTCO</b>																	
<b>Licence holder</b>			<b>ASOTEC</b>			<b>Country</b>		Germany																	
<b>Brand (optional)</b>			Alternativ- und Solartechnik GMBH			<b>Web</b>		www.asotec.de																	
<b>Street, Number</b>			Hauptstr. 65			<b>E-mail</b>		info@asotec.de																	
<b>Postcode, City</b>			57644 Hattert			<b>Tel</b>		+49 2662/939616																	
<b>Collector Type</b>						Flat plate collector																			
<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 $\vartheta_m - \vartheta_a$																			
						Gross height		Gross area (A <sub>G</sub> )		Gross length		Gross width		Aperture area (A <sub>a</sub> )		Power output per collector									
mm		m <sup>2</sup>		mm		mm		m <sup>2</sup>		0 K 10 K 30 K 50 K 70 K 105 K W W W W W W															
Ecoline Premium		2.17		1 878		1 158		2.00		1 556 1 479 1 309 1 116 901 470															
Premium Plus 2510		2.51		2 168		1 158		2.00		1 800 1 711 1 514 1 291 1 042 544															
<b>Power output per m<sup>2</sup> gross area</b>						717		682		603		515		415		217									
<b>Performance parameters test method</b>						Steady state - indoor																			
<b>Performance parameters (related to A<sub>G</sub>)</b>						η <sub>0, b</sub>		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>						0.717		3.40		0.013		0.000		0.00		9 856		0.000		0.00		0.0E+00		1.00	
<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		0.99		0.98		0.96		0.94		0.71		0.47		0.24		0.00	
<b>Longitudinal</b>						K <sub>θL, coll</sub>		1.00		0.99		0.98		0.96		0.94		0.71		0.47		0.24		0.00	
<b>Heat transfer medium for testing</b>						Water-Glycole																			
<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>						(̶ <sub>m</sub> -̶ <sub>a</sub> ) <sub>max</sub>		75		K															
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; ̶<sub>a</sub> = 30 °C)</b>						̶ <sub>stg</sub>		210		°C															
<b>Maximum operating temperature</b>						̶ <sub>max, op</sub>		120		°C															
<b>Maximum operating pressure</b>						p <sub>max, op</sub>		1000		kPa															
<b>Testing laboratory</b>						TZS, ITW University Stuttgart						www.itw.uni-stuttgart.de													
<b>Test report(s)</b>						17COL1420OEM03, 17COL1421OEM03 17COL1421QOEM03 98-08/KD issued by ISFH						<b>Dated</b>		29.07.2019 29.07.2019 13.11.2008											
<b>Comments of testing laboratory</b>						Documented performance parameters are taken from 98-08/KD issued by ISFH						Datasheet version: 6.0, 2018-10-30													
												 <b>Forschungs- und Testzentrum für Solaranlagen</b> Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)													
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>011-7S842 F</b>						
<b>Supplementary Information</b>							<b>Issued</b>		<b>2019-08-07</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>		
Ecoline Premium		2 500	1 777	1 149	1 897	1 299	804	1 391	904	542	1 524	984	578		
Premium Plus 2510		2 891	2 056	1 329	2 194	1 503	930	1 609	1 046	627	1 763	1 138	669		
Annual output per m <sup>2</sup> gross area		1 152	819	529	874	599	370	641	417	250	702	454	267		
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		$H_x$ (MJ/m <sup>2</sup> ) >		600					
Maximum tested positive load										3000		Pa			
Maximum tested negative load										2500		Pa			
Hail resistance using steel ball (maximum drop height)										1.2		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, $A_{sol}$ (m <sup>2</sup> )					Hydraulic Designation Code									
Ecoline Premium	2.17					10-VH-23R-A:7.3,1762-C:16.4,1135-NoD									
Premium Plus 2510	2.51					10-VH-23R-A:7.3,2052-C:16.4,1135-NoD									
<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 ( $\eta_{col}$ )							56%		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 ( $A_{sol}$ ) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.							First-order coefficient ( $a_1$ )		3.40		W/(m <sup>2</sup> K)				
							Second-order coefficient ( $a_2$ )		0.013		W/(m <sup>2</sup> K <sup>2</sup> )				
							Incidence angle modifier IAM (50°)		0.93		--				
							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.								
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>															