


<b>Annex to Solar Keymark Certificate</b>					<b>Licence Number</b>		<b>011-7S3161 R</b>							
					<b>Date issued</b>		<b>2023-01-24</b>							
					<b>Issued by</b>		<b>DIN CERTCO</b>							
<b>Licence holder</b>		<b>IMMERGAS S.p.A.</b>			<b>Country</b>		<b>Italy</b>							
<b>Brand (optional)</b>					<b>Web</b>		<b>https://www.immergas.com</b>							
<b>Street, Number</b>		<b>Via Cisa Ligure 95</b>			<b>E-mail</b>		<b>campodallorto_d@immergas.com</b>							
<b>Postcode, City</b>		<b>42014 Brescello RE</b>			<b>Tel</b>		<b>+39 522689011</b>							
<b>Collector Type</b>					<b>Evacuated tubular collector</b>									
<b>Collector name</b>					<b>Power output per collector</b>									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$									
					0 K	10 K	30 K	50 K	70 K	111 K				
					m <sup>2</sup>	mm	mm	mm	mm	mm				
<b>CSV14</b>					<b>2.57</b>	<b>1 647</b>	<b>1 558</b>	<b>107</b>	<b>1 519</b>	<b>1 501</b>	<b>1 456</b>	<b>1 396</b>	<b>1 322</b>	<b>1 124</b>
<b>Power output per m<sup>2</sup> gross area</b>					<b>591</b>	<b>584</b>	<b>566</b>	<b>543</b>	<b>514</b>	<b>438</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>0.588</b>	<b>0.605</b>	<b>0.007</b>	<b>0.000</b>	<b>0.000</b>	<b>30327</b>	<b>0.000</b>	<b>0.00</b>	<b>0.0E+00</b>	<b>1.033</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>		$K_{\theta T, coll}$	<b>1.03</b>	<b>1.05</b>	<b>1.17</b>	<b>1.29</b>	<b>1.54</b>	<b>1.54</b>	<b>1.37</b>	<b>0.69</b>	<b>0.00</b>			
<b>Longitudinal</b>		$K_{\theta L, coll}$	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>	<b>0.97</b>	<b>0.94</b>	<b>0.87</b>	<b>0.73</b>	<b>0.37</b>	<b>0.00</b>			
<b>Heat transfer medium for testing</b>		<b>Water</b>												
<b>Flow rate for testing (per gross area, A<sub>G</sub>)</b>		dm/dt	<b>0.020</b>	kg/(sm <sup>2</sup> )										
<b>Maximum temperature difference during thermal performance test</b>		$(\vartheta_m - \vartheta_a)_{max}$	<b>81</b>	K										
<b>Standard stagnation temperature (G = 1000 W/m<sup>2</sup>; <math>\vartheta_a = 30^\circ\text{C}</math>)</b>		$\vartheta_{stg}$	<b>272</b>	°C										
<b>Maximum operating temperature</b>		$\vartheta_{max, op}$	<b>n.s.</b>	°C										
<b>Maximum operating pressure</b>		$p_{max, op}$	<b>1000</b>	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>		14COL1193OEM04 14COL1193QOEM04					<b>Dated</b>		02.01.2023 02.01.2023					
<b>Comments of testing laboratory</b>		Documented performance parameters are taken from 14COL1193OEM04 (CSV14) This data sheet replaces the data sheet issued on 04.01.2023. (Correction of Licence Number from "011-7S3161 F" to "011-7S3161 R")					Ver. 6.2 (13.01.2022)							
							 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)							
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>														

Annex to Solar Keymark Certificate							Licence Number		011-7S3161 R					
Supplementary Information							Issued		2023-01-24					
<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	
CSV14		2 956	2 738	2 454	2 588	2 337	2 046	1 876	1 671	1 443	2 005	1 791	1 547	
Gross Thermal Yield per m <sup>2</sup> gross area		1 150	1 065	955	1 007	909	796	730	650	562	780	697	602	
Annual efficiency, $\eta_a$		65%	60%	54%	62%	56%	49%	63%	56%	48%	63%	56%	48%	
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							2800			Pa				
Maximum tested negative load							1600			Pa				
Hail resistance using ice balls (diameter)							25			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> )					
CSV14		2.57			14-V-12S-A:7.3,3030-C:16.8,1612				2.23					
<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 ( $\eta_0$ )		0.59		--					
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> )		0.61		W/(m <sup>2</sup> K)								
		Second-order coefficient (a <sub>2</sub> )		0.007		W/(m <sup>2</sup> K <sup>2</sup> )								
		Incidence angle modifier IAM (50°)		1.22		--								
		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>														