


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results						Licence Number		011-7S1748 R							
						Date issued		2016-08-30							
						Issued by		DIN CERTCO							
Licence holder		IMMERGAS Spa				Country		Italien							
Brand (optional)						Web		www.immergas.com							
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Postcode, City		42041 Brescello (RE)				Tel		+39 522 689005 / 522 690720							
Collector Type						Evacuated tubular collector									
Collector name						Power output per collector G <sub>b</sub> = 850 W/m <sup>2</sup> ; G <sub>d</sub> = 150 W/m <sup>2</sup> ; u = 3 m/s ̑ <sub>m</sub> - ̑ <sub>a</sub>									
						Gross area (A <sub>G</sub> )	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	111 K
						m <sup>2</sup>	mm	mm	mm	W	W	W	W	W	W
CSV14						2.57	1 647	1 558	107	1 519	1 501	1 456	1 396	1 322	1 124
Power output per m <sup>2</sup> gross area						591	584	566	543	514	438				
Performance parameters test method						Quasi dynamic									
Performance parameters (related to A <sub>G</sub> )						̑ <sub>0,b</sub>	c1	c2	c3	c4	c6	Kd			
Units						-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )	J/(m <sup>3</sup> K)	-	s/m	-			
Test results						0.588	0.605	0.007	0.000	0.000	0.000	1.033			
Incidence angle modifier test method						Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers						Yes									
Incidence angle modifier						Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal						K <sub>̑T, coll</sub>	1.02	1.03	1.03	1.03	1.03	1.15	1.23	0.62	0.00
Longitudinal						K <sub>̑L, coll</sub>	0.97	0.94	0.93	0.91	0.84	0.74	0.47	0.24	0.00
Heat transfer medium for testing						Water									
Flow rate for testing (per gross area, A <sub>G</sub> )						dm/dt	0.020					kg/(sm <sup>2</sup> )			
Maximum temperature difference for thermal performance calculations						(̑ <sub>m</sub> -̑ <sub>a</sub> ) <sub>max</sub>	111					K			
Standard stagnation temperature (G = 1000 W/m <sup>2</sup> ; ̑ <sub>a</sub> = 30 °C)						̑ <sub>stg</sub>	272					°C			
Effective thermal capacity, incl. fluid (per gross area, A <sub>G</sub> )						C/m <sup>2</sup>	30.327					kJ/(Km <sup>2</sup> )			
Maximum operating temperature						̑ <sub>max, op</sub>	n.a.					°C			
Maximum operating pressure						p <sub>max, op</sub>	1000					kPa			
Testing laboratory						TZS, ITW University Stuttgart				www.itw.uni-stuttgart.de					
Test report(s)						14COL1193OEM02				Dated		11.07.2016			
						14COL1193QOEM02						11.07.2016			
Comments of testing laboratory						Datasheet version: 5.01, 2016-03-01									
<p>This data sheet replaces the data sheet issued on 09.11.2011</p> <p>The data sheet is issued on the newest version 5.01</p> <p>This data sheet is issued with specifications from updated OEM test reports: 14COL1193OEM02 and 14COL1193QOEM02</p>						 <p>Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)</p>									
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	<b>Issued</b>	<b>2016-08-30</b>

**Annual collector output in kWh/collector at mean fluid temperature  $\vartheta_m$ , based on ISO 9806:2013 test results**

Standard Locations Collector name	$\vartheta_m$	Athens			Davos			Stockholm			Würzburg		
		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		2 653	2 435	2 153	2 314	2 064	1 776	1 676	1 471	1 245	1 804	1 590	1 348
Annual output per m <sup>2</sup> gross area		1 032	947	838	900	803	691	652	573	484	702	619	525
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. 5.01 (March 2016). A detailed description of the calculations is available at [www.solarkeymark.org/scenocalc](http://www.solarkeymark.org/scenocalc)

**Additional Information**

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	2800	Pa
Maximum tested negative load	1600	Pa
Hail resistance using ice balls (diameter)	25	mm

**Energy Labelling Information**

	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
CSV14	2.57	Collector efficiency ( $\eta_{col}$ )	56 %
		<i>Remark: Collector efficiency (<math>\eta_{col}</math>) 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 <math>\eta_{col}</math> is based on reference area (<math>A_{sol}</math>) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2013.</i>	
		<b>Data required for CDR (EU) No 812/2013 - Reference Area <math>A_{sol}</math></b>	
		Zero-loss efficiency ( $\eta_0$ )	0.591 --
		First-order coefficient ( $a_1$ )	0.61 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.007 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.94 --
		<i>Remark: The data given in this section are related to collector reference area (<math>A_{sol}</math>) 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.</i>	