

Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S1756F																	
					Date issued		2016-05-03																	
					Issued by																			
Licence holder		IMMERGAS S.p.A.			Country		Italy																	
Brand (optional)					Web																			
Street, Number		Via Cisa Ligure 95			E-mail																			
Postcode, City		42041, Brescello			Tel/Fax		+39 (0)522 689-450 / -178																	
Collector Type					Flat plate collector, glazed																			
Collector name					Gross area ( $A_G$ )		Gross length		Gross width		Gross height		Power output per collector $G_b = 850 \text{ W/m}^2$ ; $G_d = 150 \text{ W/m}^2$ $\vartheta_m - \vartheta_a$											
					m <sup>2</sup>		mm		mm		mm		0 K		10 K		30 K		50 K		70 K		100 K	
Collettore Solar Piano CP 4 M					2,03		1.731		1.170		84		1.460		1.390		1.232		1.048		840		481	
Collettore Solar Piano CP 4 XL					2,52		2.151		1.170		84		1.815		1.728		1.531		1.303		1.044		598	
Power output per m <sup>2</sup> gross area					721		687		608		518		415		238									
Performance parameters test method					Steady state - outdoor																			
Performance parameters (related to $A_G$ )					$\eta_0, \text{hem}$		a1		a2															
Units					-		W/(m <sup>2</sup> K)		W/(m <sup>2</sup> K <sup>2</sup> )															
Test results					0,721		3,31		0,015															
Incidence angle modifier test method					Steady state - outdoor																			
Bi-directional incidence angle modifiers					No																			
Incidence angle modifier					Angle		10°		20°		30°		40°		50°		60°		70°		80°		90°	
Transversal					$K_{GT, coll}$		1,00		1,00		0,99		0,98		0,93		0,89		0,76		0,50		0,00	
Longitudinal					$K_{GL, coll}$		1,00		1,00		0,99		0,98		0,93		0,89		0,76		0,50		0,00	
Heat transfer medium for testing					Water																			
Flow rate for testing (per gross area, $A_G$ )					dm/dt		0,020		kg/(sm <sup>2</sup> )															
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$		100		K															
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30 \text{ °C}$ )					$\vartheta_{stg}$		234		°C															
Effective thermal capacity, incl. fluid (per gross area, $A_G$ )					$C/m^2$		5,4		kJ/(Km <sup>2</sup> )															
Maximum operating temperature					$\vartheta_{max, op}$		240		°C															
Maximum operating pressure					$p_{max, op}$		1000		kPa															
Testing laboratory					TestLab Solar Thermal Systems, Fraunhofer ISE							http://www.collectortest.com												
Test report(s)					ktb-2006-35-k-j-en							Dated		02.11.2011										
Comments of testing laboratory					Datasheet version: 5.01, 2016-03-01																			
					<b>TestLab</b> Solar Thermal Systems Heidenhofstraße D-79111 Freiburg Tel: +49 (0)761 4588 5354																			
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	<b>Issued</b>	<b>2016-05-03</b>

Annual collector output in kWh/collector at mean fluid temperature $\vartheta_m$ , based on EN ISO 9806:2013 test results													
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
Collettore Solar Piano CP 4 M		2.337	1.668	1.073	1.780	1.221	748	1.309	852	503	1.424	921	536
Collettore Solar Piano CP 4 XL		2.905	2.073	1.333	2.213	1.518	930	1.628	1.059	625	1.769	1.145	666
Annual output per m <sup>2</sup> gross area		1.154	824	530	879	603	369	647	421	248	703	455	264
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 <a href="http://www.solarkeymark.org/scenocalc">www.solarkeymark.org/scenocalc</a>													

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)	EN 12975-2	--
Maximum tested positive load	1000	Pa
Maximum tested negative load	1000	Pa
Hail resistance using ice balls (diameter)	0	mm

Energy Labelling Information			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Collettore Solar Piano CP 4 M	2,03	Collector efficiency ( $\eta_{col}$ )	56 %
Collettore Solar Piano CP 4 XL	2,52	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 9806:2013.	
		Data required for CDR (EU) No 812/2013 - Reference Area $A_{sol}$	
		Zero-loss efficiency ( $\eta_0$ )	0,721 --
		First-order coefficient ( $a_1$ )	3,31 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0,015 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.	