


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		<b>011-7S2668 F</b>																	
					Date issued		<b>2017-01-12</b>																	
					Issued by		<b>Sommer</b>																	
Licence holder		<b>Viessmann Werke GmbH &amp; Co. KG</b>			Country		Germany																	
Brand (optional)		Viessmann			Web		http://www.viessmann.com																	
Street, Number		Viessmannstrasse 1			E-mail		---																	
Postcode, City		35107 Allendorf (Eder)			Tel		+49 (0)6452-70-0																	
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*		90 K*	
<b>Vitosol 200-FM SV2F</b>					2.51		2 380		1 056		90		1 900		1 793		1 548		1 212		872		525	
Power output per m <sup>2</sup> gross area					757		714		617		483		348		209									
Performance parameters test method					Steady state - indoor																			
Performance parameters (related to $A_G$ )					$\eta_{0,hem}$		a1		a2															
Units					-		W/(m <sup>2</sup> K)		W/(m <sup>2</sup> K <sup>2</sup> )															
Test results					0.757		4.069		0.020															
Incidence angle modifier test method					Quasi dynamic - outdoor																			
Bi-directional incidence angle modifiers					No																			
Incidence angle modifier					Angle		10°		20°		30°		40°		50°		60°		70°		80°		90°	
Transversal					$K_{GT,coil}$		1.00		0.99		0.97		0.94		0.89		0.81		0.63		0.33		0.00	
Longitudinal					$K_{GL,coil}$		1.00		0.99		0.97		0.94		0.89		0.81		0.63		0.33		0.00	
Heat transfer medium for testing					Water																			
Flow rate for testing (per gross area, $A_G$ )					dm/dt		0.019		kg/(sm <sup>2</sup> )															
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$		90		K															
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30^\circ\text{C}$ )					$\vartheta_{stg}$		145		°C															
Effective thermal capacity, incl. fluid (per gross area, $A_G$ )					$C/m^2$		4.9		kJ/(Km <sup>2</sup> )															
Maximum operating temperature					$\vartheta_{max,op}$		---		°C															
Maximum operating pressure					$p_{max,op}$		600		kPa															
Testing laboratory					TÜV Rheinland Energy GmbH							http://www.tuv.com/solarthermie												
Test report(s)					21232810.001							Dated		21.06.2016										
Comments of testing laboratory					As the collectors is operating with a discontinuous performance curve behavior, the performance curve above the switching point of about 50°C (absolute temperature) will be described by the following parameter $\eta_{0^*}$ , $a1^*$ , $a2^*$ [related to ...]: [A Gross] 0.807 /// 6.283 /// 0.004 The overall behavior (over the full temperature range) is approximately described by the following set of parameters [related to ...]: [A Gross] 0.761 /// 4.410 /// 0.023 ; [A Aperture] 0.820 /// 4.750 /// 0.025							Datasheet version: 5.01, 2016-03-01   <b>TÜVRheinland®</b> Genau. Richtig.  TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln												
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<b>Annex to Solar Keymark Certificate Supplementary Information</b>	<b>Licence Number</b>	<b>011-7S2668 F</b>
	<b>Issued</b>	<b>2017-01-12</b>

<b>Annual collector output in kWh/collector at mean fluid temperature <math>\vartheta_m</math>, based on EN ISO 9806:2013 test results</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 *
Vitosol 200-FM SV2F		2 892	1 912	932	2 124	1 341	599	1 575	943	408	1 713	1 010	431
Annual output per m <sup>2</sup> gross area		1 152	762	371	846	534	239	628	376	163	682	403	172
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)

<b>Additional Information</b>		
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	3500	Pa
Maximum tested negative load	3000	Pa
Hail resistance using ice balls (diameter)	35	mm

<b>Energy Labelling Information</b>			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Vitosol 200-FM SV2F	2.51	Collector efficiency ( $\eta_{col}$ )	56 %
		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 ( $\eta_0$ )	0.757 --
		First-order coefficient ( $a_1$ )	4.07 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.020 W/(m <sup>2</sup> K <sup>2</sup> )
		Incidence angle modifier IAM (50°)	0.89 --
		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.	