


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2669 F											
					Date issued		2017-01-13											
					Issued by		TÜV Rheinland Energy GmbH											
Licence holder		Viessmann Werke GmbH & Co. KG			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 ²		mm		mm		mm		0 K	10 K	30 K	50 K*	70 K*	90 K*
Vitosol 200-FM SH2F					2.51		1 056		2 380		90		1 908	1 798	1 527	1 184	830	465
Power output per m ² gross area					760		716		608		472		331		185			
Performance parameters test method					Steady state - indoor													
Performance parameters (related to A_G)					$\eta_{0,hem}$		a1		a2									
Units					-		W/(m ² K)		W/(m ² K ²)									
Test results					0.760		4.031		0.034									
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 ²)									
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$		90		K									
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ °C}$)					ϑ_{stg}		145		°C									
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m ²		5.97		kJ/(Km ²)									
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)					21232810.002 21232810.001					Dated		07.07.2016 21.06.2016						
Comments of testing laboratory					Datashet version: 5.01, 2016-03-01													
<p><i>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 ...]:</i></p> <p><i>[A Gross] 0.803 /// 6.325 /// 0.006</i></p> <p><i>The overall behavior (over the full temperature range) is approximately described by the following set of parameters [related to ...]:</i></p> <p><i>[A Gross] 0.763 /// 4.516 /// 0.026 ; [A Aperture] 0.822 /// 4.864 /// 0.029</i></p>					 TÜVRheinland® Genau. Richtig. TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln													
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S2669 F
	Issued	2017-01-13

Annual collector output in kWh/collector at mean fluid temperature ϑ_m, based on EN ISO 9806:2013 test results													
Standard Locations		Athens			Davos			Stockholm			Würzburg		
Collector name	ϑ_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 SH2F		2 896	1 854	892	2 104	1 242	560	1 569	889	384	1 708	952	407
Annual output per m ² gross area		1 154	739	355	838	495	223	625	354	153	681	379	162
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1714 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²		
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 ϑ_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													

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	3500	Pa
Maximum tested negative load	3000	Pa
Hail resistance using ice balls (diameter)	35	mm

Energy Labelling Information			
	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
Vitosol 200-FM SH2F	2.51	Collector efficiency (η_{col})	54 %
Remark: Collector efficiency (η_{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 ² , expressed in % and rounded to the nearest integer. Deviating from the regulation η_{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 (η_0)	0.760 --
		First-order coefficient (a_1)	4.03 W/(m ² K)
		Second-order coefficient (a_2)	0.034 W/(m ² K ²)
		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.			