


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S2673 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 100-FM SH1F					2.51		1 056		2 380		73		1 880		1 776		1 517		1 199		870		532	
Power output per m ² gross area					749		707		605		478		347		212									
Performance parameters test method					Steady state - indoor																			
Performance parameters (related to AG)					$\eta_{0,hem}$		a1		a2															
Units					-		W/(m ² K)		W/(m ² K ²)															
Test results					0.749		3.826		0.033															
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					$K_{GT, coll}$		1.00		0.99		0.97		0.95		0.91		0.83		0.68		0.35		0.00	
Longitudinal					$K_{GL, coll}$		1.00		0.99		0.97		0.95		0.91		0.83		0.68		0.35		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 ($G = 1000 \text{ W/m}^2; \vartheta_a = 30 \text{ }^\circ\text{C}$)					ϑ_{stg}		145		°C															
Effective thermal capacity, incl. fluid (per gross area, A_G)					C/m^2		6.4		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)					21232812.002 21232812.001 21238010.001							Dated		07.07.2016 21.06.2016 23.01.2017										
Comments of testing laboratory					<p>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] 0.792 /// 6.083 /// 0.004 The overall behavior (over the full temperature range) is approximately described by the following set of parameters [related to ...]: [A Gross] 0.752/// 4.270 /// 0.024 ; [A Aperture] 0.810 /// 4.600 /// 0.026</p>							Datasheet version: 5.01, 2016-03-01  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	011-7S2673 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 100-FM SH1F		2 889	1 883	946	2 116	1 272	610	1 576	909	415	1 716	975	438
Annual output per m ² gross area		1 151	750	377	843	507	243	628	362	165	684	389	175
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	2750	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 100-FM SH1F	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)	0.749	--
		First-order coefficient (a_1)	3.83	W/(m ² K)
		Second-order coefficient (a_2)	0.033	W/(m ² K ²)
		Incidence angle modifier IAM (50°)	0.91	--
		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.		