


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		<b>011-7S2674 F</b>											
					Date issued		<b>2017-01-13</b>											
					Issued by		TÜV Rheinland Energy GmbH											
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 100-FM SVKF</b>					2.18		2 066		1 056		73		1 635	1 545	1 319	1 038	746	448
Power output per m <sup>2</sup> gross area					750	709	605	476	342	205								
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					0.750	3.779	0.035											
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	0.80	0.61	0.31	0.00				
Longitudinal					$K_{GL,coil}$	1.00	0.99	0.97	0.94	0.89	0.80	0.61	0.31	0.00				
Heat transfer medium for testing					Water													
Flow rate for testing (per gross area, $A_G$ )					dm/dt		0.022		kg/(sm <sup>2</sup> )									
Maximum temperature difference for thermal performance calculations					$(\vartheta_m - \vartheta_a)_{max}$		90		K									
Standard stagnation temperature ( $G = 1000 \text{ W/m}^2$ ; $\vartheta_a = 30 \text{ °C}$ )					$\vartheta_{stg}$		145		°C									
Effective thermal capacity, incl. fluid (per gross area, $A_G$ )					$C/m^2$		4.15		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)					21232812.003			Dated		09.08.2016								
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 <math>\eta_{0,*}</math>, <math>a1^*</math>, <math>a2^*</math> [related to ...]:</i></p> <p><i>[A Gross] 0.801 /// 6.347 /// 0.003</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] 0.755 /// 4.439 /// 0.023 ; [A Aperture] 0.815 /// 4.790 /// 0.025</i></p>					 <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>011-7S2674 F</b>
	<b>Issued</b>	<b>2017-01-13</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 *
Vitosol 100-FM SVKF		2 480	1 609	790	1 817	1 085	509	1 352	776	346	1 471	831	365
Annual output per m <sup>2</sup> gross area		1 138	738	363	834	498	233	620	356	159	675	381	168
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)	A	--
Maximum tested positive load	3000	Pa
Maximum tested negative load	2400	Pa
Hail resistance using ice balls (diameter)	35	mm

Energy Labelling Information			
	Reference Area, $A_{sol}$ (m <sup>2</sup> )	Data required for CDR (EU) No 811/2013 - Reference Area $A_{sol}$	
Vitosol 100-FM SVKF	2.18	Collector efficiency ( $\eta_{col}$ )	54 %
		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 ( $\eta_0$ )	0.750 --
		First-order coefficient ( $a_1$ )	3.78 W/(m <sup>2</sup> K)
		Second-order coefficient ( $a_2$ )	0.035 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.	

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