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Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results		Licence Number	011-7S2672 F
		Date issued	2017-01-13
		Issued by	Sommer

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 Gb = 850 W/m²; Gd = 150 W/m² ϑm - ϑa: 0 K	10 K	30 K	50 K*	70 K*	90 K*
	m²	mm	mm	mm	W	W	W	W	W	W
Vitosol 100-FM SV1F	2.51	2 380	1 056	73	1 880	1 781	1 518	1 202	870	519
Power output per m² gross area					749	709	605	479	346	207

Performance parameters test method	Steady state - indoor								
Performance parameters (related to AG)	η0,hem	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results	0.749	3.542	0.042						

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	$K_{\theta T,coll}$	1.00	0.99	0.97	0.94	0.89	0.80	0.62	0.32	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.97	0.94	0.89	0.80	0.62	0.32	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.018	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	90	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	145	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	5.33	kJ/(Km²)
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)	21232812.001 21238010.001	**Dated**	21.06.2016 23.01.2017

Comments of testing laboratory — Datasheet version: 5.01, 2016-03-01

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 η0, a1*, a2* [related to ...]:*
[A Gross] 0.779 /// 5.549 /// 0.009
The overall behavior (over the full temperature range) is approximately described by the following set of parameters [related to ...] :
[A Gross] 0.755 /// 4.468 /// 0.021 ; [A Aperture] 0.814 /// 4.813 /// 0.023

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Supplementary Information	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 SV1F		2 857	1 858	950	2 102	1 236	611	1 565	890	419	1 702	954	441
Annual output per m² gross area		1 138	740	378	837	492	243	624	355	167	678	380	176
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1714 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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 SV1F	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/m², 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)	3.54	W/(m²K)
		Second-order coefficient (a_2)	0.042	W/(m²K²)
		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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