


Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results					Licence Number		011-7S477 F				
					Date issued		2018-07-31				
					Issued by		TÜV Rheinland Energy GmbH				
Licence holder		Vaillant GmbH			Country		Germany				
Brand (optional)		auroTHERM			Web		www.vaillant-group.com				
Street, Number		Berghauser Str. 40			E-mail		info@vaillant.com				
Postcode, City		42859 Remscheid			Tel		+49 (0)2191 180-0				
Collector Type					Flat plate collector, glazed						
Collector name	Gross area (A _G) m ²	Gross length mm	Gross width mm	Gross height mm	Power output per collector G _b = 850 W/m ² ; G _d = 150 W/m ² ϑ _m - ϑ _a						
					0 K	10 K	30 K	50 K	70 K	100 K	
					W	W	W	W	W	W	
VFK 135/2 D	2.51	1 233	2 033	80	1 840	1 745	1 543	1 322	1 083	690	
VFK 135/2 VD	2.51	2 033	1 233	80	1 840	1 745	1 543	1 322	1 083	690	
Power output per m ² gross area					734	696	615	527	432	275	
Performance parameters test method		Steady state - indoor									
Performance parameters (related to AG)		η _{0,hem}	a ₁	a ₂							
Units		-	W/(m ² K)	W/(m ² K ²)							
Test results		0.734	3.686	0.009							
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 _{θT, coll}	1.00	0.99	0.98	0.95	0.91	0.84	0.69		0.00
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.95	0.91	0.84	0.69		0.00
Heat transfer medium for testing		Water-Glycole									
Flow rate for testing (per gross area, A _G)		dm/dt	0.016	kg/(sm ²)							
Maximum temperature difference for thermal performance calculations		(ϑ _m -ϑ _a) _{max}	100	K							
Standard stagnation temperature (G = 1000 W/m ² ; ϑ _a = 30 °C)		ϑ _{stg}	200	°C							
Effective thermal capacity, incl. fluid (per gross area, A _G)		C/m ²	4.68	kJ/(Km ²)							
Maximum operating temperature		ϑ _{max, op}	195	°C							
Maximum operating pressure		p _{max, op}	1000	kPa							
Testing laboratory		TÜV Rheinland Energy GmbH				www.tuv.com/solarenergy					
Test report(s)		21221150_EN_P_135-2D; 21221150_EN_R_135-2D 21221150_EN_P_135-2VD; 21221150_EN_R_135-2VD				Dated		29.05.2013 29.05.2013			
Comments of testing laboratory		Datashet version: 5.01, 2016-03-01									
The collector tests were performed according to EN 12975-2:2006. The performance parameter related to 2.352 m ² aperture area would be η _{0,hem,a} =0.782; a _{1a} =3.929 and a _{2a} =0.010					 TÜVRheinland® Genau. Richtig. TÜV Rheinland Energy GmbH Am Grauen Stein 51105 Köln <i>st lab</i>						
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Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S477 F
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Annual collector output in kWh/collector at mean fluid temperature ϑ_m , based on EN ISO 9806:2013 test results

Standard Locations Collector name	ϑ_m	Athens			Davos			Stockholm			Würzburg		
		25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
VFK 135/2 D		2 857	2 001	1 299	2 151	1 474	932	1 583	1 024	622	1 719	1 100	658
VFK 135/2 VD		2 857	2 001	1 299	2 151	1 474	932	1 583	1 024	622	1 719	1 100	658
Annual output per m ² gross area		1 140	798	518	858	588	372	631	408	248	686	439	262
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	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	B	--
Maximum tested positive load	5400	Pa
Maximum tested negative load	3500	Pa
Hail resistance using steel ball (maximum drop height)	-	m

Energy Labelling Information

	Reference Area, A_{sol} (m ²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}	
VFK 135/2 D	2.51	Collector efficiency (η_{col})	57 %
VFK 135/2 VD	2.51	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)	0.734 --
		First-order coefficient (a_1)	3.69 W/(m ² K)
		Second-order coefficient (a_2)	0.009 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.	