


Annex to Solar Keymark Certificate					Licence Number		011-7S 478 F							
					Date issued		2021-04-29							
					Issued by		TÜV Rheinland Energy GmbH							
Licence holder		Vaillant GmbH			Country		Germany							
Brand (optional)		Vaillant			Web		www.vaillant.com							
Street, Number		Berghauser Str. 40			E-mail		info@vaillant.com							
Postcode, City		42859 Remscheid			Tel		+49 2191180-0							
Collector Type					Flat plate collector									
Collector name					Power output per collector									
					G_b = 850 W/m², G_d = 150 W/m² & u = 1.3 m/s									
					θ_m - θ_a									
					0 K	10 K	30 K	50 K	70 K	100 K				
					m²	mm	mm	mm	mm	mm				
VFK 140/3 VD					2.51	2 033	1 233	80	1 954	1 863	1 661	1 432	1 178	747
VFK 140/3 D					2.51	1 233	2 033	80	1 954	1 863	1 661	1 432	1 178	747
Power output per m² gross area					779	742	662	571	469	298				
Performance parameters test method		Quasi dynamic												
Performance parameters (related to A_G)		η₀, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd			
Units		-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-			
Test results		0.781	3.51	0.013	0.000	0.00	6 565	0.000	0.00	0.0E+00	0.98			
Incidence angle modifier test method		Quasi dynamic - outdoor												
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	0.92	0.85	0.71	0.35	0.00			
Longitudinal		K_{θL, coll}	1.00	0.99	0.98	0.95	0.92	0.85	0.71	0.35	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt		0.021	kg/(sm²)						
Maximum temperature difference during thermal performance test					(θ_m-θ_a)_{max}		70	K						
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)					θ_{stg}		220	°C						
Maximum operating temperature					θ_{max op}		n.n.	°C						
Maximum operating pressure					p_{max, op}		1000	kPa						
Testing laboratory		TÜV Rheinland Energy GmbH					http://www.tuv.com/solar							
Test report(s)		21250537.001rev01 21250537.002					Dated		29.01.2021 29.01.2021					
Comments of testing laboratory					Datasheet version: 6.1, 2019-07-11									
					 <p>TÜV Rheinland® Genau. Richtig. TÜV Rheinland Energy GmbH Am Grauer Stein 51105 Köln</p>									
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de														

Annex to Solar Keymark Certificate Supplementary Information	Licence Number	011-7S 478 F
	Issued	2021-04-29

Annual collector output in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	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
VFK 140/3 VD		3 156	2 288	1 520	2 413	1 686	1 073	1 775	1 177	722	1 939	1 281	773
VFK 140/3 D		3 156	2 288	1 520	2 413	1 686	1 073	1 775	1 177	722	1 939	1 281	773
Annual output per m ² gross area		1 257	912	606	961	672	427	707	469	288	773	510	308
Annual efficiency, η_a		71%	52%	34%	59%	41%	26%	61%	40%	25%	62%	41%	25%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1630 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. 6.1 (July 2019). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/													

Additional Information					
Collector heat transfer medium	Water-Glycole				
The collector is deemed to be suitable for roof integration	Yes				
The collector was tested successfully under the following conditions:					
Climate class (A+, A, B or C)			A+	--	
G (W/m ²) >	1100	ϑ_a (°C) >	40	H _x (MJ/m ²) >	700
Maximum tested positive load			5400	Pa	
Maximum tested negative load			3000	Pa	
Hail resistance using ice balls (diameter)			35	mm	

Additional collector attribute(s)				
<input type="checkbox"/> Using external power source(s) for normal operation	<input type="checkbox"/> Active or passive measure(s) for self-protection			
<input type="checkbox"/> Co-generating thermal and electrical power	<input type="checkbox"/> Façade collector(s)			

Energy Labelling Information		Additional Informative Technical Data	
	Reference Area, A _{sol} (m ²)	Hydraulic Designation Code	Aperture Area, A _a (m ²)
VFK 140/3 VD	2.51	1-H-1234S-A:9.2,20630-C:10.5,1180	2.35
VFK 140/3 D	2.51	1-H-14S-A:9.2,20142-C:0,0-D	2.35

Data required for CDR (EU) No 811/2013 - Reference Area A _{sol}		Data required for CDR (EU) No 812/2013 - Reference Area A _{sol}	
Collector efficiency (η_{col})	62%	Zero-loss efficiency (η_0)	0.78
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 9806:2017.		First-order coefficient (a ₁)	3.51
		Second-order coefficient (a ₂)	0.013
		Incidence angle modifier IAM (50°)	0.91
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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.			