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IGTE

Annex to Solar Keymark Certificate		Licence Number	011-7S400 F
		Date issued	2020-11-10
		Issued by	DIN CERTCO

Licence holder	**Vaillant GmbH**	**Country**	Germany
Brand (optional)		**Web**	www.vaillant.de
Street, Number	Berghauser Straße 40	**E-mail**	info@vaillant.com
Postcode, City	42859 Remscheid	**Tel**	+49 (0) 2191 18-0

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	102 K
	m²	mm	mm	mm	W	W	W	W	W	W
VFK 125/4	2.51	2 033	1 233	80	1 748	1 642	1 412	1 161	887	403
Power output per m² gross area					696	654	563	462	353	161

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	0.700	4.130	0.011	0.000	0.00	12 000	0.000	0.00	0.0	0.97

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	1.00	1.00	0.99	0.97	0.92	0.79	0.40	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	1.00	0.99	0.97	0.92	0.79	0.40	0.00

Heat transfer medium for testing		Water	
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	72	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	190	°C
Maximum operating temperature	$\vartheta_{max\ op}$	190	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
Test report(s)	20COL1577 20COL1577Q	**Dated**	10.11.2020 10.11.2020

Comments of testing laboratory Datasheet version: 6.1, 2019-09-26

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

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Supplementary Information	Issued	2020-11-10

Annual collector output in kWh/collector at mean fluid temperature ϑ_m

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
VFK 125/4		2 847	1 895	1 130	2 078	1 334	752	1 543	932	507	1 690	1 010	542
Annual output per m² gross area		1 134	755	450	828	531	300	615	371	202	673	402	216
Annual efficiency, η_a		64%	43%	25%	51%	33%	18%	53%	32%	17%	54%	32%	17%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m²			1630 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. 6.1 (September 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/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >		600
Maximum tested positive load					3000	Pa
Maximum tested negative load					2500	Pa
Hail resistance using steel ball (maximum drop height)					2	m

Additional collector attribute(s)

☐ Using external power source(s) for normal operation ☐ Active or passive measure(s) for self-protection

☐ Co-generating thermal and electrical power ☐ Façade collector(s)

Energy Labelling Information

	Reference Area, A_{sol} (m²)
VFK 125/4	2.51

Additional Informative Technical Data

Hydraulic Designation Code	Aperature Area, A_a (m²)
1-H-1234S-A:9,20630-C16,1178-D	2.35

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	51%

Remark: Collector efficiency (ηcol) 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 ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.70	--
First-order coefficient (a_1)	4.13	W/(m²K)
Second-order coefficient (a_2)	0.011	W/(m²K²)
Incidence angle modifier IAM (50°)	0.98	--

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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