Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S 478 F
	Date of issue	23-07-2012

Company	Vaillant GmbH	**Country**		Germany
Brand (optional)	auroTHERMplus	**Website**		www.vaillant.com
Street, number	Berghauser Str. 40	**E-mail**		info@vaillant.com
Postal Code	42859	**Tel.**	+49	2191180-0
City	Remscheid	**Fax**	+49	0

Collector Type (flat plate / evacuate tubular / un-glazed)	Flat plate collector
Integration in the roof possible ?	Yes

Collector name	Aperture area (Aa) [m²]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (AG) [m²]	Power output per collector unit G = 1000 W/m² Tm-Ta : 0 K [W]	10 K [W]	30 K [W]	50 K [W]	70 K [W]
VFK 140/2 D	2.35	1 233	2 033	80	2.51	1 952	1 871	1 681	1 452	1 187
VFK 140/2 VD	2.35	2 033	1 233	80	2.51	1 952	1 871	1 681	1 452	1 187

Collector efficiency parameters related to aperture area (Aa) Type of fluid and flow rate see note 1	η_{0a}	0.830	-
	a_{1a}	3.249	W/(m²K)
	a_{2a}	0.020	W/(m²K²)
Stagnation temperature - Weather conditions see note 2	t_{stg}	193	°C
Effective thermal capacity	$c_{eff} = C/A_a$	5.22	kJ/(m²K)
Max. operation pressure - see note 3	p_{max}	1000	kPa

Incidence angle modifiers $K_\theta(\theta)$	G_{DIF}/G_{TOT} min	G_{DIF}/G_{TOT} max	θ_T / θ_L	50°	10°	20°	30°	40°	60°	70°
			$K_\theta(\theta_T)$	0.93	1.00	0.99	0.98	0.96	0.88	0.77
	0.1	0.15	$K_\theta(\theta_L)$	0.93	1.00	0.99	0.98	0.96	0.88	0.77
G_{DIF}/G_{TOT}: min&max - while measuring					***Optional values***					

Testing Laboratory	TÜV Energie und Umwelt GmbH
Website	www.eco-tuv.de
Test report id. number	21219031_EN_P_140-2D; 21219031_EN_R_140-2D; 21219031_EN_P_140-2VD; 21219031_EN_R_140-2VD
Date of test report	23.07.2012 (all)
Perf. test method	EN 12975-2 6.1.5 (indoor)

Comments of testing laboratory :

Note 1	**Fluid**	Water	**Flow rate**	0.021	kg/s per m²
Note 2	**Irradiance, Gs=1000 W/m²** **Ambient temperature , Ta=30 °C**				
Note 3	**Given by manufacturer**				

TÜV Rheinland Energie und Umwelt GmbH Am Grauen Stein D - 51105 Köln

VERSION 3.5, 2012.01.13

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S 478 F
	Issued	23-07-2012

Annual collector output kWh

	Location and collector temperature (T_m)														
	Athens			Davos			Stockholm			Würzburg					
Collector name	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 140/2 D	3 115	2 302	1 534	2 594	1 828	1 141	1 776	1 197	732	1 925	1 295	778			
VFK 140/2 VD	3 115	2 302	1 534	2 594	1 828	1 141	1 776	1 197	732	1 925	1 295	778			

Collector mounting: Fixed or tracking	Fixed; slope = latitude - 15° (rounded to nearest 5 °)

Overview of locations

Location	Latitude °	Gtot kWh/m²	Ta °C	**Collector orientation or tracking mode**
Athens	38	1 765	18.5	South, 25°
Davos	47	1 714	3.2	South, 30°
Stockholm	59	1 166	7.5	South, 45°
Würzburg	50	1 244	9.0	South, 35°

Gtot	Annual total irradiation on collector plane	kWh/m²
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

Calculation of the annual collector performance is done by the official Solar Keymark spreadsheet tool. Hour by hour the collector output is calculated according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). Detailed description with all equations used is available from the Solar Keymark web site (direct link:http://www.estif.org/solarkeymark/annexb1.php)

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Datasheet version:
VERSION 3.5, 2012.01.13
Calculation program version:
3.07, October 2011 (SP)