



<b>Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>	<b>Certificate No.</b>	<b>011-7S 1937 F</b>
	Date of issue	25-05-2012

<b>Company</b>	Vaillant GmbH	<b>Country</b>	Germany
<b>Brand (optional)</b>	auroTHERMplus	<b>Website</b>	www.vaillant.com
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<b>Collector Type</b> (flat plate / evacuate tubular / un-glazed)	Flat plate collector
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<b>Integration in the roof possible ?</b>	Yes
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Collector name	Aperture area (Aa) [m <sup>2</sup> ]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (Ag) [m <sup>2</sup> ]	Power output per collector unit G = 1000 W/m <sup>2</sup> Tm-Ta :				
						0 K	10 K	30 K	50 K	70 K
						[W]	[W]	[W]	[W]	[W]
VFK 155 H	2,35	1.233	2.033	80	2,51	1.987	1.891	1.679	1.442	1.182
VFK 155 V	2,35	2.033	1.233	80	2,51	1.987	1.891	1.679	1.442	1.182

<b>Collector efficiency parameters related to aperture area (Aa)</b>	η <sub>0a</sub>	0,845	-
Type of fluid and flow rate see note 1	a <sub>1a</sub>	3,984	W/(m <sup>2</sup> K)
	a <sub>2a</sub>	0,013	W/(m <sup>2</sup> K <sup>2</sup> )

<b>Stagnation temperature</b> - Weather conditions see note 2	t <sub>stg</sub>	196	°C
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<b>Effective thermal capacity</b>	C <sub>eff</sub> = C/Aa	6,87	kJ/(m <sup>2</sup> K)
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<b>Max. operation pressure</b> - see note 3	p <sub>max</sub>	1000	kPa
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Incidence angle modifiers K <sub>θ</sub> (θ)	G <sub>DIF</sub> /G <sub>TOT</sub>		θ <sub>T</sub> / θ <sub>L</sub>	50°	10°	20°	30°	40°	60°	70°
	min	max	K <sub>θ</sub> (θ <sub>T</sub> )	0,93	1,00	0,99	0,98	0,96	0,88	0,77
	0,1	0,15	K <sub>θ</sub> (θ <sub>L</sub> )	0,93	1,00	0,99	0,98	0,96	0,88	0,77
G <sub>DIF</sub> /G <sub>TOT</sub> : min&max - while measuring					<b>Optional values</b>					

<b>Testing Laboratory</b>	TÜV Energie und Umwelt GmbH
<b>Website</b>	www.eco-tuv.de
<b>Test report id. number</b>	21219030_EN_P_155H; 21219030_EN_R_155H; 21219030_EN_P_155V; 21219030_EN_R_155V
<b>Date of test report</b>	24.05.2012 (all)
<b>Perf. test method</b>	EN 12975-2 6.1.5 (indoor)

**Comments of testing laboratory :**

Note 1	<b>Fluid</b>	Water	<b>Flow rate</b>	0,021 kg/s per m <sup>2</sup>	
Note 2	<b>Irradiance, G<sub>s</sub>=1000 W/m<sup>2</sup></b>		<b>Ambient temperature , Ta=30 °C</b>		
Note 3	<b>Given by manufacturer</b>				



<b>Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate</b>	<b>Certificate No.</b>	<b>011-7S 1937 F</b>
	Issued	25-05-2012

Annual collector output kWh															
Collector name	Location and collector temperature (T <sub>m</sub> )														
	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 155 H	3.155	2.252	1.480	2.572	1.772	1.109	1.765	1.157	705	1.917	1.249	748			
VFK 155 V	3.155	2.252	1.480	2.572	1.772	1.109	1.765	1.157	705	1.917	1.249	748			

<b>Collector mounting: Fixed or tracking</b>	Fixed; slope = latitude - 15° (rounded to nearest 5°)
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Overview of locations				
Location	Latitude °	G <sub>tot</sub> kWh/m <sup>2</sup>	T <sub>a</sub> °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°

G <sub>tot</sub>	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
T <sub>a</sub>	Mean annual ambient air temperature	°C
T <sub>m</sub>	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 (T<sub>m</sub>). 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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