


Annex to Solar Keymark Certificate					Licence Number		011-7S2980 R																																																																		
					Date issued		2020-11-10																																																																		
					Issued by		TÜV Rheinland Energy GmbH																																																																		
Licence holder		Naked Energy Ltd			Country		United Kingdom																																																																		
Brand (optional)					Web		http://www.nakedenergy.co.uk																																																																		
Street, Number		Unit 72, Basepoint Business Centre			E-mail		commercial@nakedenergy.co.uk																																																																		
Postcode, City		Metcalf Way, CRAWLEY, RH11 7XX			Tel		+44 1293 541449																																																																		
Collector Type					Evacuated tubular collector																																																																				
Collector name					Gross area (A_G)		Gross length		Gross width		Gross height		Power output per collector $G_b = 850 \text{ W/m}^2$, $G_d = 150 \text{ W/m}^2$ & $u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$																																																												
					m ²		mm		mm		mm		0 K		10 K		30 K		50 K		70 K		110 K																																																		
Virtu HOT					0.65		2 165		300		260		254		245		225		202		176		114																																																		
Power output per m ² gross area					390		377		346		310		270		175																																																										
Performance parameters test method					Quasi dynamic																																																																				
Performance parameters (related to A_G)					$\eta_{0, b}$		a1		a2		a3		a4		a5		a6		a7		a8		Kd																																																		
Units					-		W/(m ² K)		W/(m ² K ²)		J/(m ³ K)		-		J/(m ² K)		s/m		W/(m ² K ⁴)		W/(m ² K ⁴)		-																																																		
Test results					0.376		1.30		0.006		0.000		0.00		1 610		0.000		0.00		0.0E+00		1.25																																																		
Incidence angle modifier test method					Quasi dynamic - outdoor																																																																				
Incidence angle modifier					Angle		10°		20°		30°		40°		50°		60°		70°		80°		90°																																																		
Transversal					$K_{\theta T, coll}$		1.47		1.82		1.89		1.96		2.08		2.07		1.99		1.00		0.00																																																		
Longitudinal					$K_{\theta L, coll}$		1.00		1.00		0.99		0.97		0.93		0.86		0.72		0.46		0.00																																																		
Heat transfer medium for testing					Water																																																																				
Flow rate for testing (per gross area, A_G)					dm/dt		0.043		kg/(sm ²)																																																																
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		80		K																																																																
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30 \text{ °C}$)					ϑ_{stg}		240		°C																																																																
Maximum operating temperature					$\vartheta_{max, op}$		120		°C																																																																
Maximum operating pressure					$p_{max, op}$		600		kPa																																																																
Testing laboratory					TÜV Rheinland Energy GmbH							www.tuv.com/solar																																																													
Test report(s)					21249579.005							Dated		16.10.2020																																																											
Comments of testing laboratory					Datasheet version: 6.1, 2019-07-11																																																																				
<p>Virtu HOT is showing an unsymmetric transversal incidence angle modifier and is mainly mounted horizontal in E-W direction (with absorber slope of 35°). These special conditions are considered on page 2. The full transversal IAM is given below:</p> <table border="1"> <tr> <td>-70</td><td>-65</td><td>-60</td><td>-55</td><td>-50</td><td>-45</td><td>-40</td><td>-35</td><td>-30</td><td>-25</td><td>-20</td><td>-15</td><td>-10</td><td>-5</td><td>0</td><td>5</td><td>10</td><td>15</td><td>20</td><td>25</td><td>30</td><td>35</td><td>40</td><td>45</td><td>50</td><td>55</td> </tr> <tr> <td>1.97</td><td>2.04</td><td>2.07</td><td>2.07</td><td>2.08</td><td>2.00</td><td>1.96</td><td>1.89</td><td>1.89</td><td>1.80</td><td>1.82</td><td>1.64</td><td>1.47</td><td>1.31</td><td>1.00</td><td>0.84</td><td>0.77</td><td>0.71</td><td>0.67</td><td>0.57</td><td>0.56</td><td>0.45</td><td>0.45</td><td>0.42</td><td>0.37</td><td>0.36</td> </tr> </table> <p>The interconnection between the single tubes is not part of considered gross area.</p>					-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55	1.97	2.04	2.07	2.07	2.08	2.00	1.96	1.89	1.89	1.80	1.82	1.64	1.47	1.31	1.00	0.84	0.77	0.71	0.67	0.57	0.56	0.45	0.45	0.42	0.37	0.36	 <p>TÜV Rheinland Energy GmbH Am Grunhofsteil 51105 Köln</p>																
-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55																																																
1.97	2.04	2.07	2.07	2.08	2.00	1.96	1.89	1.89	1.80	1.82	1.64	1.47	1.31	1.00	0.84	0.77	0.71	0.67	0.57	0.56	0.45	0.45	0.42	0.37	0.36																																																
<p align="center">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</p>																																																																									

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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
Virtu HOT		508	417	325	470	383	303	344	272	208	354	277	207
Annual output per m ² gross area		782	641	501	723	590	466	528	418	320	544	426	319
Annual efficiency, η_a		44%	36%	28%	45%	37%	29%	46%	37%	28%	44%	35%	26%
Fixed or tracking collector		Fixed (slope = 25°)											
Annual irradiation on collector plane		1765 kWh/m ²			1604 kWh/m ²			1143 kWh/m ²			1234 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, 25°			South, 25°			South, 25°		
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										No			
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										2500		Pa	
Maximum tested negative load										2400		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 checked="" 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)					
Virtu HOT		0.65			1-VH-12S-A:6.4,4284-C:20.2,289			0.64					
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}													
Collector efficiency (η_{col})		33%			Zero-loss efficiency (η_0)			0.39		--			
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)			1.30		W/(m ² K)						
		Second-order coefficient (a ₂)			0.006		W/(m ² K ²)						
		Incidence angle modifier IAM (50°)			1.80		--						
Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}													
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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