TÜVRheinland®
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Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2169 F
	Date of issue	15.07.2013

Company	Grant Engineering Ltd.	**Country**		England
Brand (optional)	Hopton House.	**Website**		www. grantuk.com
Street, number	Hopton Industrial Estate	**E-mail**		neil@grantuk.com
Postal Code	SN10 2EU	**Tel.**	+44	1 380 736 920
City	Devizes, Wiltshire	**Fax**	+44	1 380 736 991

Collector Type (flat plate / evacuate tubular / un-glazed)	Flat plate collector
Integration in the roof possible ?	No

Collector name	Aperture area (Aa)	Gross length	Gross width	Gross height	Gross area (AG)	Power output per collector unit G = 1000 W/m² Tm-Ta : 0 K	10 K	30 K	50 K	70 K
	[m²]	[mm]	[mm]	[mm]	[m²]	[W]	[W]	[W]	[W]	[W]
Grant Solar Sahara	2.13	2 043	1 143	80	2.34	1 759	1 663	1 460	1 244	1 014
Grant Solar Aurora	2.13	2 043	1 143	80	2.34	1 759	1 663	1 460	1 244	1 014

Collector efficiency parameters related to aperture area (Aa) Type of fluid and flow rate see note 1	η_{0a}	0.826	-
	a_{1a}	4.441	W/(m²K)
	a_{2a}	0.008	W/(m²K²)
Stagnation temperature - Weather conditions see note 2	t_{stg}	177	°C
Effective thermal capacity	$c_{eff} = C/A_a$	12.62	kJ/(m²K)
Max. operation pressure - see note 3	p_{max}	1000	kPa

Incidence angle modifiers $K_\theta(\theta)$	G_{DIF}/G_{TOT} min	max	θ_T / θ_L	50°	10°	20°	30°	40°	60°	70°
			$K_\theta(\theta_T)$	0.92	1.00	0.99	0.98	0.96	0.86	0.73
	-	-	$K_\theta(\theta_L)$	0.92	1.00	0.99	0.98	0.96	0.86	0.73
G_{DIF}/G_{TOT}: min&max - while measuring					***Optional values***					

Testing Laboratory	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number	10COL871/1OEM04
Date of test report	15.07.2013
Perf. test method	EN 12975-2 6.1.4 (outdoor)

Comments of testing laboratory :

Note 1	**Fluid**	Water	**Flow rate**	0.020	kg/s per m²
Note 2	**Irradiance, Gs=1000 W/m²** **Ambient temperature , Ta=30 °C**				
Note 3	**Given by manufacturer**				

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

VERSION 3.6, 2012.01.13

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2169 F
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Annual collector output kWh

Collector name	Location and collector temperature (Tm)														
	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			
Grant Solar Sahara	2 749	1 894	1 214	2 194	1 471	911	1 511	962	577	1 644	1 034	611			
Grant Solar Aurora	2 749	1 894	1 214	2 194	1 471	911	1 511	962	577	1 644	1 034	611			

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:
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Calculation program version:
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