Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	SKM 9964
	Issued	30/5/2014

Company holding the	NOBEL INTERNATIONAL EAD	Countr	BULGARIA
Brand (optional)		Website	
Street, street number	48, VITOSHA BLV	E-mail	info1@nobel.gr
Postal Code / City,	2100 SOFIA BULGARIA	Tel/Fax	+359 2 4210232

Collector Type (flat plate glazed/un-glazed; evacuate tubular)	Flat plate collector - glazed
Thermal / photo voltaic hybid collector? (PVT collector)	No
Integration in the roof possible ? (manufacturers declaration)	Yes

	Aperture area (Aa)	Gross length	Gross width	Gross height	Gross area (AG)	Power output per collector module G = 1000 W/m², Tm-Ta				
						0 K	10 K	30 K	50 K	70 K
Collector name	m²	mm	mm	mm	m²	W	W	W	W	W
APOLLON GRD MDR 2000	1.81	2,007	1,006	107	2.02	1,372	1,289	1,117	934	741

Performance test method	Glazed liquid heating collector - steady state - outdoor		
Performance parameters related to aperture	η0	a1	a2
Units	-	W/(m²K)	W/(m²K²)
Test results - Flow rate and fluid see note 1	0.758	4.489	0.007

Bi-directional incidence angle	No	*Kϑ values are obligatory for 50°.*								
Incidence angle modifiers Kθ(θ)	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
	Kθ(θ)			0.96	0.90	0.83	0.75			0.00
Incidence angle modifier not bi-directional - leave fields blank										

Stagnation temperature - Weather conditions see note 2	Tstg	167.5	°C
Effective thermal capacity	ceff = C/Ag	10.2	kJ/(m²K)
Max. intende operation temperature - see note 3	Tmax,op	195	°C
Max. operation pressure - see note 3	pmax,op	100	kPa

Pressure drop table - for a collector family, the values shall be for the module with highest ΔP per m² aperture area

Flow rate	kg/(s m²)	0.000	0.004	0.008	0.012	0.016	0.019	0.023	0.028	0.033	0.041
Pressure drop, ΔP	Pa	0	699	2235	4451	7505	10725	14904	21327	27686	40874

Optional weather data	Location		Link	
Testing Laboratory	NCSR "Demokritos"			
Website	www.solar.demokritos.gr			
Test report id. number	4130 DE1, 4131 DQ1, 4137 DE1,	Date of test report	6/11/2013, 13/1/2014,	

During the test GDIF/GTOT was always between 0.16 and 0.26

Comments of testing laboratory:

Note 1	Flow rate	0.020	kg/(s m²)	Fluid	Water
Note 2	Irradiance, G = 1000 W/m²; Ambient temperature , Ta=30 °C				
Note 3	Given by manufacturer				

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Datasheet version: 4.06, 2014-01-15

Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	SKM 9964
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Annual collector output kWh/module

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
APOLLON GRD MDR 2000	1,978	1,282	766	1,433	920	535	1,060	638	360	1,153	680	376

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

The calculation of the annual collector performance is performed with the official Solar Keymark spreadsheet tool ScenoCalc. The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm). A detailed description of the calculations is available at http://www.sp.se/en/index/services/solar/ScenoCalc/Sidor/default.aspx.

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Datasheet version: 4.06, 2014-01-15

ScenoCalc version: Ver. 4.06 (Jan, 2014)