Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Licence Number	011-7S2440 F
	Issued	2014-12-02

Company holding the	HRsolar B. V.		Country	Netherlands
Brand (optional)	-		Website	www.hrsolar.nl
Street, street number	Leehove 4		E-mail	info@hrsolar.nl
Postal Code / City, province	NL-2678	MC De Lier	Tel	+31 (0)174523303

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

Collector name	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
	m²	mm	mm	mm	m²	W	W	W	W	W
HPC-1,6	1.46	1 650	990	94	1.63	1 218	1 156	1 018	863	690

Performance test method	Glazed liquid heating collector - steady state - indoor									
Performance parameters related to aperture	η0	a1	a2							
Units	-	W/(m²K)	W/(m²K²)							
Test results - Flow rate and fluid see note 1	0.837	4.13	0.015							

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)	1.00	0.99	0.98	0.95	0.91	0.84	-	-	0.00
Incidence angle modifier not bi-directional - leave fields blank										

Stagnation temperature - Weather conditions see note 2	Tstg	221	°C
Effective thermal capacity	ceff = C/Ag	5	kJ/(m²K)
Max. intende operation temperature - see note 3	Tmax,op	-	°C
Max. operation pressure - see note 3	pmax,op	600	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)	0.005	0.014	0.019	0.027	0.034					
Pressure drop, ΔP	Pa	3990	9870	14570	21230	28390					

Optional weather data	Location		Link	
Testing Laboratory	Institut für Solarenergieforschung Hameln (ISFH)			
Website	www.isfh.de			
Test report id. number	56-14/K	Date of test report	2014.11.27	
During the test GDIF/GTOT was always between	0.1	and	0.3	

Comments of testing laboratory:

The pressure drop was measured with a mixture water:glycol (58:42).
The incidence angle modifier was determined outdoor according to a quasi-dynamic test procedure.
The collector efficiency parameter and incidence angle modifiers are related to G(DIF)/G(TOT)=0.15.

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	011-7S2440 F
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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
HPC-1,6	1 872	1 301	820	1 410	952	577	1 035	662	388	1 125	710	410

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)