TÜVRheinland®
DIN CERTCO

Summary of EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2324 R
	Date of issue	05 March 2014

Company	OEG Oel- und Gasfeuerungsbedarf Handelsgesellschaft m.b.H.	**Country**		Germany
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Collector Type (flat plate / evacuate tubular / un-glazed)	Evacuated tubular collector
Integration in the roof possible ?	No

Collector name	Aperture area (Aa) [m²]	Gross length [mm]	Gross width [mm]	Gross height [mm]	Gross area (AG) [m²]	Power output per collector unit G = 1000 W/m² Tm-Ta : 0 K [W]	10 K [W]	30 K [W]	50 K [W]	70 K [W]
4flex+	0.11	1 965	71	80	0.14	81	79	75	70	65
4flex+ (for 10 tubes)	1.06	1 965	710	80	1.40	809	791	749	701	646

Collector efficiency parameters related to aperture area (Aa) Type of fluid and flow rate see note 1	η_{0a}	0.760	-
	a_{1a}	1.621	W/(m²K)
	a_{2a}	0.008	W/(m²K²)
Stagnation temperature - Weather conditions see note 2	t_{stg}	100	°C
Effective thermal capacity	c_{eff} = C/Aa	4.74	kJ/(m²K)
Max. operation pressure - see note 3	p_{max}	600	kPa

Incidence angle modifiers $K_\theta(\theta)$	G_{DIF}/G_{TOT} min	G_{DIF}/G_{TOT} max	θ_T / θ_L	50°	10°	20°	30°	40°	60°	70°
			$K_\theta(\theta_T)$	0.96	*1.00*	*1.02*	*1.06*	*1.05*	*0.88*	*0.72*
	0.08	0.15	$K_\theta(\theta_L)$	0.97	*1.00*	*1.00*	*0.99*	*0.98*	*0.94*	*0.89*
G_{DIF}/G_{TOT}: min&max - while measuring					***Optional values***					

Testing Laboratory	TÜV Energie und Umwelt GmbH
Website	www.eco-tuv.de
Test report id. number	21214195_P_HP90; 21214195_R
Date of test report	27 February 2014; 27 February 2014
Perf. test method	EN 12975-2 6.1.5 (indoor)

Comments of testing laboratory :

This collector is using a temperature limiter for stagnation protection. The starting point of this limiter is at about 70°C, so the results for Output Power at 50K and 70 K as well as the anual colelctor output at 75°C collector mean temperature could be lower. With the existing efficiency curves, it is not possible to describe the special characteristic of this collector for the full temperature range.

The special construction allows to put a various number of tubes together. The tube itself could be seen as collector.

Note 1	**Fluid**	Water	**Flow rate**	0.024	kg/s per m²
Note 2	**Irradiance, Gs=1000 W/m²** **Ambient temperature , Ta=30 °C**				
Note 3	**Given by manufacturer**				

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Annual collector output based on EN 12975 Test Results, annex to Solar KEYMARK Certificate	Certificate No.	011-7S2324 R
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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			
4flex+	136	116	96	121	102	83	82	67	52	89	72	56			
4flex+ (for 10 tubes)	1 356	1 162	960	1 214	1 024	829	820	667	524	885	721	565			

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:
3.07, October 2011 (SP)