

Annex to Solar Keymark Certificate						Licence Number		011-7S1733 F				
						Date issued		2019-12-16				
						Issued by		ISFH CalTeC				
Licence holder		OEG Oel- und Gasfeuerungsbedarf				Country		Germany				
Brand (optional)						Web		http://www.oeg.net				
Street, Number		Industriestraße 1				E-mail		info@oeg.net				
Postcode, City		D- 31849 Hessisch Oldendorf				Tel		+49 5152 / 669 -0				
Collector Type						Flat plate collector						
Collector name		Gross height	Gross area (A_G)	Gross length	Gross width	Aperture area (A_a)	Power output per collector					
							G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s θ _m - θ _a					
		mm	m ²	mm	mm	m ²	0 K	10 K	30 K	50 K	70 K	86 K
4 Plus-Harfe		80	2.53	2,104	1,204	2.34	1,807	1,711	1,504	1,278	1,032	822
Power output per m² gross area						714	676	594	505	408	325	
Performance parameters test method		Steady state - indoor										
Performance parameters (related to A_G)		η _{0, b}	a ₁	a ₂	a ₃	a ₄	a ₅	a ₆	a ₇	a ₈	K _d	
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		0.730	3.71	0.010			3,834				0.86	
Incidence angle modifier test method		Quasi dynamic - outdoor										
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°	
Transversal		K _{θT, coll}	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	0.00	
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	0.00	
Heat transfer medium for testing						Water						
Flow rate for testing (per gross area, A_G)						dm/dt	0.031	kg/(sm ²)				
Maximum temperature difference during thermal performance test						(θ _m -θ _a) _{max}	56	K				
Standard stagnation temperature (G = 1000 W/m²; θ_a = 30 °C)						θ _{stg}	210	°C				
Maximum operating temperature						θ _{max op}	100	°C				
Maximum operating pressure						p _{max, op}	1000	kPa				
Testing laboratory		Institut für Solarenergieforschung Hameln				http://www.isfh.de						
Test report(s)		113-11/KD 114-11/KQ				Dated		10.10.2011 10.10.2011				
Comments of testing laboratory						Datasheet version: 6.0, 2018-10-30						
The collector was tested according to EN 12975-2:2006. The collector was exposed 37 days at above 14 MJ/m ² and 62.5 h at above 850 W/m ² and 10 °C.						Institut für Solarenergieforschung GmbH Am Ohrberg 1 D-31860 Emmerthal Tel.: 05151/999-100 Fax: 05151/999-500						
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Supplementary Information		Issued		2019-12-16									
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
4 Plus-Harfe		2,808	1,941	1,235	2,101	1,419	876	1,548	987	585	1,682	1,059	618
Annual output per m ² gross area		1,110	767	488	830	561	346	612	390	231	665	419	244
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)												
Annual irradiation on collector plane	1765 kWh/m ²			1714 kWh/m ²			1166 kWh/m ²			1244 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, 30°			South, 45°			South, 35°			
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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc													
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)	--												
G (W/m ²) >	see comment	ϑ_a (°C) >				H_x (MJ/m ²) >							
Maximum tested positive load											5000	Pa	
Maximum tested negative load											2890	Pa	
Hail resistance using steel ball (maximum drop height)											1.6	m	
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 type="checkbox"/> Wind and/or infrared sensitive collector(s) (WISC)												
<input type="checkbox"/> Façade collector(s)													
Energy Labelling Information													
	Reference Area, A_{sol} (m ²)		Hydraulic Designation Code										
4 Plus-Harfe	2.53		7-VH-1234S-A:5.3,1926-C:16.5,1248										
Data required for CDR (EU) No 811/2013 - Reference Area				Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}									
Collector efficiency (η_{col})	55%			Zero-loss efficiency (η_0)	0.71		--						
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)	3.71		W/(m ² K)						
				Second-order coefficient (a_2)	0.010		W/(m ² K ²)						
				Incidence angle modifier IAM (50°)	0.91		--						
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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