

Annex to Solar Keymark Certificate					Licence Number		011-7S1733 F				
					Date issued		2021-12-17				
					Issued by		ISFH CalTeC				
Licence holder		OEG Oel- und Gasfeuerungsbedarf			Country		Germany				
Brand (optional)					Web		www.oeg.net				
Street, Number		Industriestr. 1			E-mail		info@oeg.net				
Postcode, City		D- 31840 Hessisch Oldendorf			Tel		+49 5152 699-0				
Collector Type					Flat plate collector						
Collector name		Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector					
						$G_b = 850 \text{ W/m}^2$, $G_d = 150 \text{ W/m}^2$ & $u = 1.3 \text{ m/s}$ $\vartheta_m - \vartheta_a$					
	m^2	mm	mm	mm		0 K	10 K	30 K	50 K	70 K	87 K
						W	W	W	W	W	W
4Plus-Harfe	2.53	2 102	1 202	80		1 810	1 715	1 510	1 285	1 039	815
Power output per m^2 gross area						715	678	597	508	411	322
Performance parameters test method		Steady state - indoor									
Performance parameters (related to A_G)		η_0 , b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units		-	$\text{W}/(\text{m}^2\text{K})$	$\text{W}/(\text{m}^2\text{K}^2)$	$\text{J}/(\text{m}^3\text{K})$	-	$\text{J}/(\text{m}^2\text{K})$	s/m	$\text{W}/(\text{m}^2\text{K}^4)$	$\text{W}/(\text{m}^2\text{K}^4)$	-
Test results		0.728	3.65	0.010			4 770				0.88
Incidence angle modifier test method		Quasi dynamic - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		$K_{\theta T, coll}$	1.00	0.99	0.98	0.96	0.93	0.87	0.75	0.37	0.00
Longitudinal		$K_{\theta L, coll}$	1.00	0.99	0.98	0.96	0.93	0.87	0.75	0.37	0.00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A_G)					dm/dt		0.096		$\text{kg}/(\text{s m}^2)$		
Maximum temperature difference during thermal performance test					$(\vartheta_m - \vartheta_a)_{max}$		57		K		
Standard stagnation temperature ($G = 1000 \text{ W/m}^2$; $\vartheta_a = 30^\circ\text{C}$)					ϑ_{stg}		200		°C		
Maximum operating temperature					$\vartheta_{max, op}$		100		°C		
Maximum operating pressure					$p_{max, op}$		1000		kPa		
Testing laboratory		ISFH CalTeC					http://www.isfh.de				
Test report(s)		170-21/B					Dated		16.12.2021		
Comments of testing laboratory					Datasheet version: 6.1, 2019-07-11						
					Institut für Solarenergieforschung GmbH An Ohrberg 1 D-31800 Emmerthal Tel.: 05151/999-100 Fax 05151/999-500						
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de											



Annex to Solar Keymark Certificate										Licence Number		011-7S1733 F	
Supplementary Information										Issued		2021-12-17	
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
4Plus-Harfe		2 841	1 977	1 265	2 130	1 444	893	1 571	1 005	598	1 709	1 083	633
Annual output per m ² gross area		1 123	782	500	842	571	353	621	397	236	675	428	250
Annual efficiency, η_a		64%	44%	28%	52%	35%	22%	53%	34%	20%	54%	34%	20%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1630 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. 6.1 (July 2019). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/													
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)										A		--	
G (W/m ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >		600			
Maximum tested positive load										3030		Pa	
Maximum tested negative load										2800		Pa	
Hail resistance using steel ball (maximum drop height)										2		m	
Additional collector attribute(s)													
☐ Using external power source(s) for normal operation										☐ Active or passive measure(s) for self-protection			
☐ Co-generating thermal and electrical power										☐ Façade collector(s)			
Energy Labelling Information					Additional Informative Technical Data								
		Reference Area, A _{sol} (m ²)			Hydraulic Designation Code					Aperture Area, A _a (m ²)			
4Plus-Harfe		2.53			7-VH-1234S-A:7.3,1926-C:17.3,1248-					2.36			
Data required for CDR (EU) No 811/2013 - Reference Area A _{sol}					Data required for CDR (EU) No 812/2013 - Reference Area A _{sol}								
Collector efficiency (η_{col})		55%			Zero-loss efficiency (η_0)					0.72		--	
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)					3.65		W/(m ² K)	
					Second-order coefficient (a ₂)					0.010		W/(m ² K ²)	
					Incidence angle modifier IAM (50°)					0.92		--	
					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.								
DIN CERTCO • Alboinstraße 56 • 12103 Berlin, Germany													
Tel: +49 30 7562-1131 • Fax: +49 30 7562-1141 • E-Mail: info@dincertco.de • www.dincertco.de													