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ISFH CalTeC

Annex to Solar Keymark Certificate

Licence Number	**011-7S2997 F**
Date issued	**2020-12-22**
Issued by	**ISFH CalTeC**

Licence holder	**Technea**	**Country**	Netherlands
Brand (optional)		**Web**	http://www.technea.nl
Street, Number	Pallasweg 13	**E-mail**	info@technea.nl
Postcode, City	NL- 8938 Leeuwarden	**Tel**	+31 58 - 2884739

Collector Type	Flat plate collector

Collector name	Gross area (A_G)	Gross length	Gross width	Gross height	**Power output per collector** Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	86 K
	m²	mm	mm	mm	W	W	W	W	W	W
FK 253 HA-4A-zwart	2.53	2 104	1 204	80	1 809	1 712	1 505	1 279	1 033	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)	η0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units	-	W/(m²K)	W/(m²K²)	J/(m³K)	-	J/(m²K)	s/m	W/(m²K⁴)	W/(m²K⁴)	-
Test results	0.729	3.71	0.010			3 829				0.86

Incidence angle modifier test method		Quasi dynamic - outdoor								
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.98	0.96	0.92	0.86	0.73	0.33	0.00

Heat transfer medium for testing	Water-Glycole		
Flow rate for testing (per gross area, A_G)	dm/dt	0.031	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	56	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	207	°C
Maximum operating temperature	$\vartheta_{max\ op}$	-	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	ISFH CalTeC	http://www.isfh.de	
Test report(s)	133-20/B	**Dated**	22.12.2020

Comments of testing laboratory — Datasheet version: 6.1, 2019-07-11

The tests have been performed according to EN 12975-2:2006.

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Supplementary Information	Issued	2020-12-22

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
FK 253 HA-4A-zwart	2 813	1 944	1 237	2 104	1 421	877	1 551	988	586	1 685	1 061	619
Annual output per m² gross area	1 110	768	488	831	561	346	612	390	231	665	419	244
Annual efficiency, η_a	63%	43%	28%	51%	34%	21%	53%	33%	20%	53%	34%	20%
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
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 ϑm (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)					B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >		540
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)

☐ 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

	Reference Area, A_{sol} (m²)
FK 253 HA-4A-zwart	2.53

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}

Collector efficiency (η_{col})	55%

Remark: Collector efficiency (ηcol) 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/m², expressed in % and rounded to the nearest integer. Deviating from the regulation ηcol is based on reference area (Asol) which is aperture area for values according to EN 12975-2 or gross area for ISO 9806:2017.

Additional Informative Technical Data

Hydraulic Designation Code	Aperature Area, A_a (m²)
7-VH-1234S-A:5.3,1926-C:16.5,1248	2.34

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}

Zero-loss efficiency (η_0)	0.71	--
First-order coefficient (a_1)	3.71	W/(m²K)
Second-order coefficient (a_2)	0.010	W/(m²K²)
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.