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ISFH CalTeC

Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results

Licence Number	**011-7S2481 F**
Date issued	**2017-06-09**
Issued by	**ISFH CalTeC**

Licence holder	KBB Kollektorbau GmbH	**Country**	Germany
Brand (optional)	-	**Web**	www.kbb-solar.com
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Postcode, City	12439, Berlin	**Tel**	+49 (0)30 678 1789 -0

Collector Type	Flat plate collector, glazed

	Gross area (A_G)	Gross length	Gross width	Gross height	Power output per collector Gb = 850 W/m²; Gd = 150 W/m² ϑm - ϑa					
					0 K	10 K	30 K	50 K	70 K	90 K
Collector name	m²	mm	mm	mm	W	W	W	W	W	W
K420-VH4L-TS2	2.02	1908	1058	75	1 392	1 318	1 155	972	767	541
Power output per m² gross area					689	653	572	481	380	268

Performance parameters test method	Steady state - indoor								
Performance parameters (related to AG)	η0,hem	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results	0.689	3.51	0.013						

Incidence angle modifier test method	Quasi dynamic - outdoor									
Bi-directional incidence angle modifiers	No									
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$	1.00	0.99	0.98	0.95	0.91	0.84			0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.98	0.95	0.91	0.84			0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.054	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	90	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	210	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m^2	4.1	kJ/(Km²)
Maximum operating temperature	$\vartheta_{max\ op}$	120	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Solarenergieforschung GmbH	www.isfh.de	
Test report(s)	15-17/K	**Dated**	30.05.2017

Comments of testing laboratory — Datasheet version: 5.01, 2016-03-01

1) The incidence angle modifier was determined outdoor according to a quasi-dynamic test procedure.
2) Peak collector efficiency η0,b = 0.704
(reference to Tm* = 0, based on beam irradiance Gb)
3) The recommended fluid flow rate is close to the transition region between laminar and turbulent flow. In order to characterize the collector in a reproducible way, it was necessary to use a higher flow rate (in accordance with ISO 9806: 2013-11 section 24.4.1).

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Supplementary Information	Issued	2017-06-09

Annual collector output in kWh/collector at mean fluid temperature ϑ_m, based on ISO 9806:2013 test results

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
K420-VH4L-TS2	2 137	1 466	906	1 598	1 063	629	1 176	740	425	1 278	795	448
Annual output per m² gross area	1 058	726	448	791	526	311	582	366	210	633	393	222
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1714 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. 5.01 (March 2016). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

Additional Information

Collector heat transfer medium	Water-Glycole	
Hybrid Thermal and Photo Voltaic collector	No	
The collector is deemed to be suitable for roof integration	No	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	A	--
Maximum tested positive load	5300	Pa
Maximum tested negative load	3230	Pa
Hail resistance using steel ball (maximum drop height)	2	m

Energy Labelling Information

	Reference Area, A_{sol} (m^2)
K420-VH4L-TS2	2.02

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
Collector efficiency (η_{col})	53	%

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/m², 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 9806:2013.

Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}		
Zero-loss efficiency (η_0)	0.689	--
First-order coefficient (a_1)	3.51	W/(m²K)
Second-order coefficient (a_2)	0.013	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.

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