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

Licence Number	**011-7S2892 F**
Date issued	**2018-10-19**
Issued by	**DIN CERTCO**

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Collector Type	Flat plate collector, glazed

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 = 3 m/s ϑm - ϑa: 0 K	10 K	30 K	50 K	70 K	100 K
	m²	mm	mm	mm	W	W	W	W	W	W
BTE1.5-1	1.50	1 000	1 500	80	1 069	1 012	888	753	607	369
BTE1.5-2	1.50	1 500	1 000	80	1 069	1 012	888	753	607	369
BTE2.0-1	2.00	1 000	2 000	80	1 426	1 349	1 183	1 004	810	491
BTE2.0-2	2.00	2 000	1 000	80	1 426	1 349	1 183	1 004	810	491
BTE2.4-1	2.40	1 000	2 400	80	1 711	1 618	1 420	1 204	971	590
BTE2.4-2	2.40	2 400	1 000	80	1 711	1 618	1 420	1 204	971	590
BTE2.5-1	2.50	2 500	1 000	80	1 782	1 686	1 479	1 255	1 012	614
BTE2.5-2	2.52	2 100	1 200	80	1 797	1 699	1 491	1 265	1 020	619
BTE3.0-1	3.00	3 000	1 000	80	2 139	2 023	1 775	1 505	1 214	737
BTE3.0-2	3.00	2 500	1 200	80	2 139	2 023	1 775	1 505	1 214	737
Power output per m² gross area					713	674	592	502	405	246

Performance parameters test method		Quasi dynamic							
Performance parameters (related to AG)		η0,b	c1	c2	c3	c4	c6	Kd	
Units		-	W/(m²K)	W/(m²K²)	J/(m³K)	-	s/m	-	
Test results		0.720	3.773	0.009	0.000	0.000	0.000	0.935	
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	0.97	0.94	0.89	0.81	0.63	-	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.97	0.94	0.89	0.81	0.63	-	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.020	kg/(sm²)
Maximum temperature difference for thermal performance calculations	$(\vartheta_m-\vartheta_a)_{max}$	100	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	213	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	11.8	kJ/(Km²)
Maximum operating temperature	ϑ_{max_op}	99	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	TÜV Rheinland (Shanghai) Co., Ltd.	www.tuv.com	
Test report(s)	50185938-001 50185938-001	**Dated**	10/18/2018 10/18/2018

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

Given collector parameters are determined on BTE1.5-2;
Performance parameters related to 1.39m² aperture area would be $\eta 0_{,hem,a}$=0.780, a_{1a}=4.083, a_{2a}=0.010.

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Supplementary Information	Issued	2018-10-19

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
BTE1.5-1	1 680	1 158	734	1 249	838	512	923	584	345	1 009	632	366
BTE1.5-2	1 680	1 158	734	1 249	838	512	923	584	345	1 009	632	366
BTE2.0-1	2 240	1 544	978	1 666	1 117	683	1 231	779	460	1 345	842	488
BTE2.0-2	2 240	1 544	978	1 666	1 117	683	1 231	779	460	1 345	842	488
BTE2.4-1	2 689	1 853	1 174	1 999	1 340	820	1 478	935	552	1 614	1 011	585
BTE2.4-2	2 689	1 853	1 174	1 999	1 340	820	1 478	935	552	1 614	1 011	585
BTE2.5-1	2 801	1 930	1 223	2 082	1 396	854	1 539	974	575	1 681	1 053	610
BTE2.5-2	2 823	1 945	1 233	2 099	1 408	861	1 551	982	580	1 695	1 061	615
BTE3.0-1	3 361	2 316	1 468	2 499	1 676	1 025	1 847	1 169	690	2 018	1 263	732
BTE3.0-2	3 361	2 316	1 468	2 499	1 676	1 025	1 847	1 169	690	2 018	1 263	732
Annual output per m² gross area	1 120	772	489	833	559	342	616	390	230	673	421	244
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	Yes	
The collector was tested successfully according to EN ISO 9806:2013 under the following conditions:		
Climate class (A, B or C)	B	--
Maximum tested positive load	2200	Pa
Maximum tested negative load	1650	Pa
Hail resistance using steel ball (maximum drop height)	1.0	m

Energy Labelling Information

	Reference Area, A_{sol} (m^2)
BTE1.5-1	1.50
BTE1.5-2	1.50
BTE2.0-1	2.00
BTE2.0-2	2.00
BTE2.4-1	2.40
BTE2.4-2	2.40
BTE2.5-1	2.50
BTE2.5-2	2.52
BTE3.0-1	3.00
BTE3.0-2	3.00

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

Collector efficiency (η_{col})	55	%

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)	0.713	--
First-order coefficient (a_1)	3.77	W/(m²K)
Second-order coefficient (a_2)	0.009	W/(m²K²)
Incidence angle modifier IAM (50°)	0.89	--

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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