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Annex to Solar Keymark Certificate - Summary of EN ISO 9806:2013 Test Results		Licence Number	011-7S425 F
		Date issued	2016-10-27
		Issued by	DIN CERTCO

Licence holder	**Citrin Solar GmbH**	**Country**	Deutschland
Brand (optional)		**Web**	www.citrinsolar.de
Street, Number	Böhmerwaldstrasse 32	**E-mail**	info@citrinsolar.de
Postcode, City	85368 Moosburg	**Tel**	+49 (0) 8761 3340-0 /(0) 8761 3340-40

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 ϑm - ϑa: 0 K	10 K	30 K	50 K	70 K	90 K
	m²	mm	mm	mm	W	W	W	W	W	W
CS 300	2.02	1 965	1 026	80	1 483	1 405	1 240	1 058	862	651
CS 350	2.53	2 186	1 158	80	1 857	1 760	1 553	1 326	1 080	815
Power output per m² gross area					734	696	614	524	427	322

Performance parameters test method	Steady state - indoor								
Performance parameters (related to AG)	η0,hem	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results	0.734	3.73	0.0094						

Incidence angle modifier test method	Steady state - indoor								
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	1.00	0.99	0.98	0.95	0.88	0.75	0.49	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	1.00	0.99	0.98	0.95	0.88	0.75	0.49	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.044	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}	195	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	4.814	kJ/(Km²)
Maximum operating temperature	ϑ_{max_op}	130	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	TZS, ITW University Stuttgart	www.itw.uni-stuttgart.de	
Test report(s)	C1355LPEN (SPF)	**Dated**	26.10.2010
	C1355QPEN (SPF)		26.10.2016
	P-20150101 (ASIC)		06.02.2015

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

documented performance parameters are taken from C1355LPEN (SPF)

TZS Forschungs- und Testzentrum für Solaranlagen
Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)

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Supplementary Information	Issued	2016-10-27

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
CS 300	2 369	1 665	1 081	1 784	1 224	771	1 314	849	513	1 430	916	545
CS 350	2 968	2 085	1 355	2 235	1 533	966	1 646	1 063	643	1 791	1 148	683
Annual output per m² gross area	1 173	824	535	883	606	382	650	420	254	708	454	270
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)	B	--
Maximum tested positive load	1000	Pa
Maximum tested negative load	1000	Pa
Hail resistance using steel ball (maximum drop height)	n.a.	m

Energy Labelling Information

	Reference Area, A_{sol} (m^2)
CS 300	2.02
CS 350	2.53

Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
Collector efficiency (η_{col})	57	%

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)	0.734	--
First-order coefficient (a_1)	3.73	W/(m²K)
Second-order coefficient (a_2)	0.0094	W/(m²K²)
Incidence angle modifier IAM (50°)	0.95	--

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.