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

Licence Number	011-7S2885 F
Date issued	2018-09-18
Issued by	DINCERTCO

Licence holder	UNICAL AG S.p.A.	Country	ITALY
Brand (optional)	--	Web	http://www.unical.it
Street, Number	Via Romana 123	E-mail	info@info.info
Postcode, City	46033 Casteldario - Mantova	Tel	+39 37657001

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	51 K
	m²	mm	mm	mm	W	W	W	W	W	W
L SUN	2,62	2.022	1.295	90	2.072	1.981	1.777	1.543	1.280	1.530
Power output per m² gross area					791	756	678	589	488	584

Performance parameters test method	Steady state - indoor								
Performance parameters (related to AG)	η0,hem	a1	a2						
Units	-	W/(m²K)	W/(m²K²)						
Test results	0,791	3,342	0,014						

Incidence angle modifier test method		Steady state - outdoor								
Bi-directional incidence angle modifiers	No									
Incidence angle modifier	Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal	$K_{\theta T,coll}$					0,95				0,00
Longitudinal	$K_{\theta L,coll}$					0,95				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	$(\vartheta_m-\vartheta_a)_{max}$	51	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	196,6	°C
Effective thermal capacity, incl. fluid (per gross area, A_G)	C/m²	4,486	kJ/(Km²)
Maximum operating temperature	ϑ_{max_op}	250	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Fundación CENER - CIEMAT, LEST	http://www.cener.com	
Test report(s)	30.3139.1-5-1 30.3139.1-6-1 30.3434.0	Dated	11/12/2017 31/10/2017 19/09/2018

Comments of testing laboratory

Datasheet version: 5.01, 2016-03-01

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Supplementary Information	Issued	2018-09-18

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
L SUN	3.352	2.467	1.672	2.589	1.842	1.197	1.903	1.285	804	2.065	1.392	855
Annual output per m² gross area	1.279	942	638	988	703	457	726	490	307	788	531	327
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)	A	--
Maximum tested positive load	2400	Pa
Maximum tested negative load	2400	Pa
Hail resistance using ice balls (diameter)	25	mm

Energy Labelling Information

	Reference Area, A_{sol} (m²)	Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}		
L SUN	2,62	Collector efficiency (η_{col})	63	%
		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)	0,791	--
		First-order coefficient (a_1)	3,34	W/(m²K)
		Second-order coefficient (a_2)	0,014	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.		