TÜVRheinland®
DIN CERTCO
Precisely Right.

Annex to Solar Keymark Certificate

Licence Number	**011-7S2932 F**
Date issued	**2019-07-29**
Issued by	**DIN CERTCO**

Licence holder	**ENSIT SRL**	**Country**	Italy
Brand (optional)		**Web**	www.ensit.it
Street, Number	Via Asiago 12	**E-mail**	info@ensit.it
Postcode, City	92127 Catania (CT)	**Tel**	+39 958362430

Collector Type	Flat plate collector

Collector name	**Gross height**	**Gross area (A_G)**	**Gross length**	**Gross width**	**Aperture area (A_a)**	**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	116 K
	mm	m²	mm	mm	m²	W	W	W	W	W	W
ENSIT EVO 2.5	103	2.52	2 006	1 257	2.33	1 821	1 735	1 550	1 344	1 118	521
ENSIT EVO 2.9	103	2.92	2 006	1 457	2.71	2 110	2 011	1 796	1 557	1 295	604
Power output per m² gross area						723	689	615	533	444	207

Performance parameters test method	Quasi dynamic									
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	0.727	3.29	0.010	0.000	0.00	10 165	0.000	0.00	0.0E+00	0.96

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	0.97	0.94	0.89	0.79	0.47	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.98	0.97	0.94	0.89	0.79	0.47	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 during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	86	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	185	°C
Maximum operating temperature	ϑ_{max_op}	n.a.	°C
Maximum operating pressure	$p_{max,op}$	1600	kPa

Testing laboratory	TZS, ITW University Stuttgart	www.itw.uni-stuttgart.de	
Test report(s)	10COL931/3OEM08	**Dated**	29.07.2019
	10COL932/3OEM08		29.07.2019
	10COL932Q/4OEM08		29.07.2019

Comments of testing laboratory — Datasheet version: 6.0, 2018-10-30

Documented performance parameters are taken from 10COL931/3OEM08 (ENSIT EVO 2.5)

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	2019-07-29

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
ENSIT EVO 2.5	2 953	2 147	1 449	2 259	1 595	1 039	1 662	1 110	695	1 811	1 206	743
ENSIT EVO 2.9	3 422	2 488	1 679	2 618	1 848	1 203	1 925	1 287	805	2 099	1 398	860
Annual output per m² gross area	1 172	852	575	896	633	412	659	441	276	719	479	295
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. 6.0 (October 2018). A detailed description of the calculations is available at www.solarkeymark.org/scenocalc

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					3000	Pa
Maximum tested negative load					2000	Pa
Hail resistance using steel ball (maximum drop height)					n.a.	m

Additional collector attribute(s)

- ☐ Using external power source(s) for normal operation
- ☐ Co-generating thermal and electrical power
- ☐ Façade collector(s)
- ☐ Active or passive measure(s) for self-protection
- ☐ Wind and/or infrared sensitive collector(s) (WISC)

Energy Labelling Information

	Reference Area, A_{sol} (m²)	Hydraulic Designation Code
ENSIT EVO 2.5	2.52	11-V-1234S-A:7.2,1894-C20.6,1310-D
ENSIT EVO 2.9	2.92	12-V-1234S-A:7.2,1894-C20.6,1510-D

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

Collector efficiency (η_{col})	58%

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.

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

Zero-loss efficiency (η_0)	0.72	--
First-order coefficient (a_1)	3.29	W/(m²K)
Second-order coefficient (a_2)	0.010	W/(m²K²)
Incidence angle modifier IAM (50°)	0.94	--

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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