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IGTE

Annex to Solar Keymark Certificate		Licence Number	011-7S3134 F
		Date issued	2022-08-31
		Issued by	DIN CERTCO

Licence holder	FULL'ELEC SARL	Country	France	
Brand (optional)		Web	www.solidro.fr	
Street, Number	26 rue de l'industrie	E-mail	yildirimej@gmail.com	
Postcode, City	67170 Brumath	Tel	+33	6 80 80 74 09

Collector Type	Flat plate collector

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 = 1.3 m/s $\vartheta_m - \vartheta_a$					
					0 K	10 K	30 K	50 K	70 K	106 K
	m²	mm	mm	mm	W	W	W	W	W	W
SOLARIS M	1.79	1927	927	90	1229	1165	1029	880	718	394
SOLARIS L	2.07	1988	1041	90	1421	1348	1190	1018	830	455
SOLARIS XL	2.42	1988	1219	90	1661	1576	1391	1190	971	532
Power output per m² gross area					686	651	575	492	401	220

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	0.692	3.446	0.009	0.000	0.00	9 231	0.000	0.00	0.0	0.946

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	0.97	0.93	0.88	0.78	0.57	0.00	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.99	0.97	0.93	0.88	0.78	0.57	0.00	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	$(\vartheta_m-\vartheta_a)_{max}$	76	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	190	°C
Maximum operating temperature	ϑ_{max_op}	120	°C
Maximum operating pressure	$p_{max,op}$	1000	kPa

Testing laboratory	Institut für Gebäudeenergetik, Thermotechnik und Energiespeicherung (IGTE)	http://www.igte.uni-stuttgart.de	
Test report(s)	13COL1187OEM01 13COL1188OEM01 13COL1188QOEM01	Dated	22.08.2022 22.08.2022 22.08.2022

Comments of testing laboratory	Ver. 6.2 (13.01.2022)
Documented performance parameters are taken from 13COL1188OEM01 (SOLARIS XL)	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	2022-08-31

Gross Thermal Yield 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
SOLARIS M	1 927	1 349	873	1 448	987	616	1 065	688	415	1 165	744	441
SOLARIS L	2 228	1 560	1 009	1 674	1 141	713	1 231	796	480	1 347	861	510
SOLARIS XL	2 605	1 824	1 180	1 957	1 334	833	1 439	930	561	1 574	1 006	596
Gross Thermal Yield per m² gross area	1 077	754	488	809	551	344	595	384	232	651	416	246
Annual efficiency, η_a	61%	43%	28%	50%	34%	21%	51%	33%	20%	52%	33%	20%
Fixed or tracking collector	Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane	1765 kWh/m²			1630 kWh/m²			1166 kWh/m²			1244 kWh/m²		
Mean annual ambient air	18.5°C			3.2°C			7.5°C			9.0°C		
Collector orientation or tracking	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. 6.2 (13.01.2022). A detailed description of the calculations is available at http://www.estif.org/solarkeymarknew/

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)				A	--
G (W/m²) >	1000	ϑ_a (°C) >	20	H_x (MJ/m²) >	600
Maximum tested positive load				3000	Pa
Maximum tested negative load				2250	Pa
Hail resistance using steel ball (maximum drop height)				2	m

Additional collector attribute(s)

Using external power source(s) for normal operation	No	Active or passive measure(s) for self-protection	No
Co-generating thermal and electrical power	No	Façade collector(s)	No

Energy Labelling Information

	Reference Area, A_{sol} (m²)
SOLARIS M	1.79
SOLARIS L	2.07
SOLARIS XL	2.42

Additional Informative Technical Data

	Hydraulic Designation Code	Aperture Area, A_a (m²)
SOLARIS M	8-V-4L,2R&3R,1L-7.1,1840-16.6,973	1.62
SOLARIS L	9-V-4L,2R&3R,1L-7.1,1900-16.6,1087	1.92
SOLARIS XL	10-V-4L,2R&3R,1L-7.1,1900-	2.23

Data required for CDR (EU) No 811/2013 - Reference Area

Collector efficiency (η_{col})	53%

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)	0.69	--
First-order coefficient (a_1)	3.45	W/(m²K)
Second-order coefficient (a_2)	0.009	W/(m²K²)
Incidence angle modifier IAM (50°)	0.88	--

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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