TÜVRheinland®
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Annex to Solar Keymark Certificate

Licence Number	**011-7S2183 F**
Date issued	**2022-03-25**
Issued by	**DINCERTCO**

Licence holder	**Evertec Sp.z o.o**	**Country**	Poland
Brand (optional)	-	**Web**	www.evertecsolutions.com
Street, Number	Leszno 59	**E-mail**	a.sapieha@evertecsolutions.com
Postcode, City	06-300 Przasnysz	**Tel**	+48 29 752 58 22

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	100 K
	m²	mm	mm	mm	W	W	W	W	W	W
Metrosol 20	2.01	1 675	1 200	55	1 445	1 365	1 188	988	766	390
Metrosol 25	2.51	2 090	1 200	55	1 803	1 703	1 482	1 233	955	487
Power output per m² gross area					719	679	591	492	381	194

Performance parameters test method	Steady state - indoor									
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	0.730	3.85	0.014	0.000	0.00	4 858	0.000	0.00	0.0E+00	0.90

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	0.98	0.96	0.92	0.86	0.74	0.51	0.26	0.00
Longitudinal	$K_{\theta L,coll}$	1.00	0.98	0.96	0.92	0.86	0.74	0.51	0.26	0.00

Heat transfer medium for testing	Water		
Flow rate for testing (per gross area, A_G)	dm/dt	0.022	kg/(sm²)
Maximum temperature difference during thermal performance test	$(\vartheta_m-\vartheta_a)_{max}$	70	K
Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C)	ϑ_{stg}	190	°C
Maximum operating temperature	ϑ_{max_op}	-	°C
Maximum operating pressure	$p_{max,op}$	600	kPa

Testing laboratory	TÜV Rheinland Solar GmbH	http://www.tuv.com/solar	
Test report(s)	21221539_EN_P_MS20 21221539_EN_R_MS25	**Dated**	24.06.2013 24.06.2013

Comments of testing laboratory Ver. 6.2 (13.01.2022)

The collector was tested according to EN 12975-2:2006; The performance figures were converted to gross area:

	Area [m²]	dm/dt [kg/(sm²]	a5 [J/(m²K)]	h0,hem [ ]	h0,b [ ]	a1 [W/(m²K)]	a2 [W/(m²K²)]	Kd [ ]
Initial values based on aptertur area	1.867	0.0236	5230	0.774	-	4.145	0.015	-
New values based on gross area	2.01	0.022	4858	0.719	0.730	3.850	0.014	0.900

TÜVRheinland® lab
Cenau. Richtig.
TÜV Rheinland Solar GmbH
Am Grauen Stein
51105 Köln

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Supplementary Information	Issued	2022-03-25

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
Metrosol 20		2 205	1 480	885	1 624	1 050	594	1 203	736	408	1 313	794	429
Metrosol 25		2 752	1 846	1 104	2 026	1 310	741	1 501	918	509	1 639	990	535
Gross Thermal Yield per m² gross area		1 097	736	440	808	522	295	598	366	203	653	395	213
Annual efficiency, η_a		62%	42%	25%	50%	32%	18%	51%	31%	17%	53%	32%	17%
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 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. 6.2 (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)				B	--
G (W/m²) >	900	ϑ_a (°C) >	15	H_x (MJ/m²) >	540
Maximum tested positive load				5400	Pa
Maximum tested negative load				2400	Pa
Hail resistance using ice balls (diameter)				-	mm

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)
Metrosol 20	2.01
Metrosol 25	2.51

Additional Informative Technical Data

Hydraulic Designation Code	Aperture Area, A_a (m²)
	1.87
	2.35

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

Collector efficiency (η_{col})	54%

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)	3.85	W/(m²K)
Second-order coefficient (a_2)	0.014	W/(m²K²)
Incidence angle modifier IAM (50°)	0.85	--

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.