


Annex to Solar Keymark Certificate					Licence Number		TSU 001-19				
					Date issued		2024-08-16				
					Issued by		TSU Piešťany, a. s.				
Licence holder		Skorut Systémy Solárne Sp. z o. o.			Country		Poland				
Brand (optional)					Web		http://www.skorut-solar.pl/				
Street, Number		ul. Wybickiego 71			E-mail		office@skorut-solar.pl				
Postcode, City		32-400 Myślenice			Tel		+48 12 272 -20 25				
Collector Type					Flat plate collector						
Collector name					Power output per collector						
					Gb = 850 W/m ² , Gd = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$						
					0 K	10 K	30 K	50 K	70 K	90 K	
					m ²	mm	mm	mm	W	W	W
MAX 1.1					2.32	2,037	1,137	80	1,729	1,652	1,484
Power output per m ² gross area					745	712	640	559	471	375	
Performance parameters test method		Steady state - outdoor									
Performance parameters (related to A _G)		η_0, b	a1	a2	a3	a4	a5	a6	a7	a8	Kd
Units		-	W/(m ² K)	W/(m ² K ²)	J/(m ³ K)	-	J/(m ² K)	s/m	W/(m ² K ⁴)	W/(m ² K ⁴)	-
Test results		0.759	3.22	0.010	0.000	0.00	5,690	0.000	0.00	0.0E+00	0.88
Incidence angle modifier test method		Steady state - outdoor									
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
Transversal		K _{θT, coll}	1.00	0.99	0.98	0.96	0.92	0.86	0.74	0.35	0.00
Longitudinal		K _{θL, coll}	1.00	0.99	0.98	0.96	0.92	0.86	0.74	0.35	0.00
Heat transfer medium for testing					Water						
Flow rate for testing (per gross area, A _G)					dm/dt	0.019	kg/(sm ²)				
Maximum temperature difference during thermal performance test					($\vartheta_m - \vartheta_a$) _{max}	60	K				
Standard stagnation temperature (G = 1000 W/m ² ; $\vartheta_a = 30$ °C)					ϑ_{stg}	200	°C				
Maximum operating temperature					$\vartheta_{max, op}$	100	°C				
Maximum operating pressure					p _{max, op}	1000	kPa				
Testing laboratory		Technický skúšobný ústav Piešťany, š.p			http://www.tsu.sk						
Test report(s)		190700001/PQ			Dated		24-6-2019				
Comments of testing laboratory					Ver. 6.2 (13.01.2022)						
					 TECHNICKÝ SKÚŠOBNÝ ÚSTAV PIEŠŤANY, a. s. Krajinská cesta 2929/9 921 01 PIEŠŤANY -212-						
Technický skúšobný ústav, a. s. Address: Krajinská cesta 2929/9, 921 01 Piešťany, Slovak republic, mail: tsu@tsu.sk; web: www.tsu.eu											

Annex to Solar Keymark Certificate Supplementary Information		Licence Number		TSU 001-19									
		Issued		2024-08-16									
Gross Thermal Yield in kWh/collector at mean fluid temperature ϑ_m													
Collector name	Standard Locations	Athens			Davos			Stockholm			Würzburg		
	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
MAX 1.1		2,725	1,998	1,369	2,104	1,507	1,005	1,540	1,046	670	1,671	1,128	711
Gross Thermal Yield per m ² gross area		1,174	861	590	907	649	433	664	451	289	720	486	306
Annual efficiency, η_a		67%	49%	33%	56%	40%	27%	57%	39%	25%	58%	39%	25%
Fixed or tracking collector		Fixed (slope = latitude - 15°; rounded to nearest 5°)											
Annual irradiation on collector plane		1765 kWh/m ²			1630 kWh/m ²			1166 kWh/m ²			1244 kWh/m ²		
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 ϑ_m (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										Yes			
The collector was tested successfully under the following conditions:													
Climate class (A+, A, B or C)										B		--	
G (W/m ²) >		900		ϑ_a (°C) >		15		H_x (MJ/m ²) >		540			
Maximum tested positive load										1800		Pa	
Maximum tested negative load										1000		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						Additional Informative Technical Data							
		Reference Area, A_{sol} (m ²)				Hydraulic Designation Code			Aperture Area, A_a (m ²)				
MAX 1.1		2.32				1-VH-12V-A:12,20000			2.13				
Data required for CDR (EU) No 811/2013 - Reference Area						Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}							
Collector efficiency (η_{col})		60%				Zero-loss efficiency (η_0)			0.75			--	
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/m ² , 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 9806:2017.		First-order coefficient (a_1)			3.22			W/(m ² K)					
		Second-order coefficient (a_2)			0.010			W/(m ² K ²)					
		Incidence angle modifier IAM (50°)			0.92			--					
						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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