


Annex to Solar Keymark Certificate					Licence Number		011-7S3155 R							
					Date issued		2022-12-08							
					Issued by		DIN CERTCO							
Licence holder		CIRELIUS, S.A.			Country		PORTUGAL							
Brand (optional)		SOLIUS			Web		WWW.SOLIUS.PT							
Street, Number		RUA DA CANCELA VELHA, 26			E-mail		INFO@SOLIUS.PT							
Postcode, City		4430-660 AVINTES			Tel		+35 1227843817							
Collector Type					Evacuated tubular collector									
Collector name					Power output per collector									
					$G_b = 850 \text{ W/m}^2, G_d = 150 \text{ W/m}^2 \text{ \& } u = 1.3 \text{ m/s}$ $\dot{\vartheta}_m - \dot{\vartheta}_a$									
					0 K	10 K	30 K	50 K	70 K	77 K				
					W	W	W	W	W	W				
Solius TuboSol HP-20					3.26	1,990	1,640	155	1,302	1,263	1,158	1,016	837	768
Solius TuboSol HP-30					4.82	1,990	2,420	155	1,923	1,866	1,710	1,500	1,236	1,134
Power output per m² gross area					399	387	355	311	256	235				
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		0.396	1.057	0.014	0.000	0.000	5,270	0.000	0.000	0.000	1.051			
Incidence angle modifier test method		Steady state - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		$K_{\theta T, coll}$	1.02	1.04	1.14	1.24	1.38	1.46	0.97	0.49	0.00			
Longitudinal		$K_{\theta L, coll}$	1.00	1.00	0.99	0.96	0.92	0.84	0.69	0.44	0.00			
Heat transfer medium for testing					Water									
Flow rate for testing (per gross area, A_G)					dm/dt		0.020	$kg/(sm^2)$						
Maximum temperature difference during thermal performance test					$(\dot{\vartheta}_m - \dot{\vartheta}_a)_{max}$		46.8	K						
Standard stagnation temperature (G = 1000 W/m²; $\dot{\vartheta}_a = 30 \text{ }^\circ\text{C}$)					$\dot{\vartheta}_{stg}$		240	°C						
Maximum operating temperature					$\dot{\vartheta}_{max, op}$		120	°C						
Maximum operating pressure					$p_{max, op}$		600	kPa						
Testing laboratory		Intertek Testing Services Shenzhen Ltd. Guangzhou Branch					http://www.intertek.com							
Test report(s)		221118145GZU-001					Dated		2022/12/5					
Comments of testing laboratory					Draft Ver. 6.2 (22.09.2021)									
None					 Stamp & signature									
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Supplementary Information		Issued		2022-12-08									
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
Solius TuboSol HP-20		2,429	1,967	1,425	1,975	1,504	1,018	1,450	1,077	715	1,568	1,169	766
Solius TuboSol HP-30		3,587	2,906	2,104	2,917	2,221	1,504	2,141	1,590	1,057	2,316	1,726	1,131
Gross Thermal Yield per m ² gross area		744	603	436	605	461	312	444	330	219	480	358	235
Annual efficiency, η_a		42%	34%	25%	37%	28%	19%	38%	28%	19%	39%	29%	19%
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 Draft Ver. 6.2 (22.09.2021). 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)				C									
G (W/m ²) >		800		ϑ_a (°C) >									
				10									
Maximum tested positive load				2400 Pa									
Maximum tested negative load				2400 Pa									
Hail resistance using steel ball (maximum drop height)				1 m									
Additional collector attribute(s)													
Using external power source(s) for normal operation		No		Active or passive measure(s) for self-protection									
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)									
Solius TuboSol HP-20	3.26	1-H-12S-C:20,1722-D		1.86									
Solius TuboSol HP-30	4.82	1-H-12S-C:20,2502-D		2.79									
Data required for CDR (EU) No 811/2013 - Reference Area A_{sol}			Data required for CDR (EU) No 812/2013 - Reference Area A_{sol}										
Collector efficiency (η_{col})		33%		Zero-loss efficiency (η_0)									
				0.40									
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)		1.06 W/(m ² K)									
		Second-order coefficient (a_2)		0.014 W/(m ² K ²)									
		Incidence angle modifier IAM (50°)		1.17									
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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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