


Annex to Solar Keymark Certificate					Licence Number		011-7S2927 F							
					Date issued		2024-02-28							
					Issued by		DINCERTCO							
Licence holder		ECOFER OIKONOMOU Z. KOSTAS			Country		GREECE							
Brand (optional)		ECOFER			Web		www.ecofer.com.gr							
Street, Number		XANTHIPPOU 150			E-mail		zachos@ecofer.com.gr							
Postcode, City		GR-15669 PAPAGOOU ATHENS			Tel		+30 2106715510							
Collector Type					Flat plate collector									
Collector name					Power output per collector G _b = 850 W/m ² , G _d = 150 W/m ² & u = 1.3 m/s $\vartheta_m - \vartheta_a$									
					Gross area (A_G)	Gross length	Gross width	Gross height	0 K	10 K	30 K	50 K	70 K	112 K
					m ²	mm	mm	mm	W	W	W	W	W	W
ECOFER SMARTEVO 15					1.51	1 503	1 007	85	1 093	1 037	921	797	666	367
ECOFER SMARTEVO 17					1.68	1 420	1 183	85	1 216	1 154	1 024	886	741	408
ECOFER SMARTEVO 19					1.96	1 503	1 305	85	1 419	1 346	1 195	1 034	864	476
ECOFER SMARTEVO 20					2.02	2 006	1 007	85	1 462	1 388	1 232	1 066	890	490
ECOFER SMARTEVO 23					2.24	1 893	1 183	85	1 621	1 539	1 366	1 182	987	544
ECOFER SMARTEVO 25					2.52	2 006	1 257	85	1 824	1 731	1 536	1 330	1 111	612
ECOFER SMARTEVO 27					2.67	2 261	1 183	85	1 933	1 834	1 628	1 409	1 177	648
ECOFER SMARTEVO 29					2.92	2 006	1 457	85	2 114	2 006	1 780	1 541	1 287	709
Power output per m² gross area					724	687	610	528	441	243				
Performance parameters test method		Quasi dynamic												
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		0.725	3.62	0.006	0.000	0.00	13 660	0.000	0.00	0.0	0.99			
Incidence angle modifier test method		Quasi dynamic - outdoor												
Incidence angle modifier		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°			
Transversal		K _{θT, coll}	1.00	1.00	1.00	0.99	0.96	0.87	0.63	0.32	0.00			
Longitudinal		K _{θL, coll}	1.00	1.00	1.00	0.99	0.96	0.87	0.63	0.32	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					$(\vartheta_m - \vartheta_a)_{max}$		82	K						
Standard stagnation temperature (G = 1000 W/m²; $\vartheta_a = 30$ °C)					ϑ_{stg}		230	°C						
Maximum operating temperature					$\vartheta_{max, op}$		-	°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)		21COL1631OEM24 21COL1631QOEM25 21COL1632OEM28					Dated		19.02.2024 19.02.2024 19.02.2024					
Comments of testing laboratory					Ver. 6.2 (13.01.2022)									
Documented performance parameters are taken from 21COL1632OEM28 (ECOFER SMARTEVO 15)					 Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70550 Stuttgart (Vaihingen)									
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Supplementary Information		011-7S2927 F											
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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
ECOFER SMARTEVO 15		1 793	1 286	869	1 361	958	635	997	662	419	1 091	719	449
ECOFER SMARTEVO 17		1 994	1 431	967	1 514	1 066	707	1 109	736	466	1 214	800	500
ECOFER SMARTEVO 19		2 327	1 669	1 128	1 767	1 244	825	1 294	859	544	1 416	934	583
ECOFER SMARTEVO 20		2 398	1 720	1 163	1 821	1 282	850	1 334	885	560	1 460	962	601
ECOFER SMARTEVO 23		2 659	1 907	1 289	2 019	1 421	942	1 479	981	621	1 618	1 067	666
ECOFER SMARTEVO 25		2 992	2 146	1 451	2 272	1 599	1 060	1 664	1 104	699	1 821	1 200	750
ECOFER SMARTEVO 27		3 170	2 273	1 537	2 407	1 694	1 123	1 763	1 170	741	1 929	1 272	794
ECOFER SMARTEVO 29		3 466	2 486	1 681	2 632	1 853	1 228	1 928	1 279	810	2 110	1 391	869
Gross Thermal Yield per m ² gross area		1 187	851	576	901	635	421	660	438	277	723	476	298
Annual efficiency, η_a		67%	48%	33%	55%	39%	26%	57%	38%	24%	58%	38%	24%
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										No			
The collector was tested successfully under the following conditions:													
Climate class (A+, A, B or C)										A		--	
G (W/m ²) >		1000		ϑ_a (°C) >		20		H _x (MJ/m ²) >		600			
Maximum tested positive load										2750		Pa	
Maximum tested negative load										2400		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)					
ECOFER SMARTEVO 15		1.51		8-V-1234S-7.2,1383-20.6,1060-D				1.36					
ECOFER SMARTEVO 17		1.68		10-V-1234S-7.2,1303-20.6,1240-D				1.52					
ECOFER SMARTEVO 19		1.96		11-V-1234S-7.2,1383-20.6,1370-D				1.79					
ECOFER SMARTEVO 20		2.02		8-V-1234S-7.2,1888-20.6,1060-D				1.83					
ECOFER SMARTEVO 23		2.24		10-V-1234S-7.2,1773-20.6,1240-D				2.05					
ECOFER SMARTEVO 25		2.52		11-V-1234S-7.2,1888-20.6,1310-D				2.32					
ECOFER SMARTEVO 27		2.67		10-V-1234S-7.2,2143-20.6,1240-D				2.46					
ECOFER SMARTEVO 29		2.92		12-V-1234S-7.2,1888-20.6,1510-D				2.71					
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})		57%				Zero-loss efficiency (η_0)		0.72		--			
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)		3.62		W/(m ² K)					
				Second-order coefficient (a ₂)		0.006		W/(m ² K ²)					
				Incidence angle modifier IAM (50°)		0.98		--					
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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