

Page 1/2 Licence Number **SKM 10087** 2019-09-24 **Annex to Solar Keymark Certificate** Date issued Issued by **DQS Hellas** PAPAEMMANOUEL S.A. Licence holder Country Greece Brand (optional) MTEC-2.72 Web www.papaemmanouel.gr 10 Km Inofyta – St. Thomas, Inofyta Viotia Street, Number exports@papaemmanouel.gr E-mail +30 22620 31931 Postcode, City 32011, Viotia Tel Flat plate collector **Collector Type** Power output per collector Aperture area (A_a) area (A_G) Gb = 850 W/m2, Gd = 150 W/m2 & u = 1.3 m/s height length Gross width Gross $\vartheta_m - \vartheta_a$ Collector name 0 K 10 K 30 K 50 K 70 K 85 K m² W W W W W W m² mm mm mm MTEC-27V 2,220 2.73 2.56 2,119 1,904 1,420 1,220 101 2,162 1,261 1,671 MTEC-27H 101 2,162 1,261 2.56 2,220 2,119 1,904 1,671 1,420 1,220 Power output per m² gross area 813 776 697 612 520 447 Performance parameters test method Quasi dynamic Performance parameters (related to A_G) η0, b a4 a5 a6 Kd a1 a2 a3 a7 a8 Units $W/(m^2K^2)$ $J/(m^3K)$ $W/(m^2K)$ $J/(m^2K)$ s/m W/(m²K⁴) W/(m²K⁴ Test results 0.0E+00 0.94 0.820 3.61 0.008 0.000 0.00 0 0.000 0.00 Incidence angle modifier test method Quasi dynamic - outdoor Incidence angle modifier Angle 10° 20° 30° 40° 50° 60° 70° 80° 90° Transversal 1.00 1.00 0.99 0.97 0.93 0.84 0.69 0.44 0.00 K_{θ⊤.coll} $K_{\theta L coll}$ 1.00 1.00 0.99 0.97 0.93 0.69 0.44 0.00 Longitudinal 0.84 Heat transfer medium for testing Nater-Glycole Flow rate for testing (per gross area, A_G) dm/dt 0.022 kg/(sm²) Maximum temperature difference during thermal performance test $(\vartheta_m - \vartheta_a)_{max}$ 55 Standard stagnation temperature (G = 1000 W/m²; ϑ_a = 30 °C) $\vartheta_{ ext{stg}}$ 200.37 °C ϑ_{max op} °C Maximum operating temperature 210 Maximum operating pressure p_{max,op} 1000 NCSR Demokritos / Solar & other Energy System Testing laboratory www.solar.demokritos.gr Test report(s) 4248 DQ1 Dated 1/8/2019 4254 DE1 11/7/2019 Comments of testing laboratory Datasheet version: 6.0, 2018-10-30 N.C.S.R "DEMOKRITOS"
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Annex to Solar Keymark Certific	Licence Number				nber	SKM 10087						
Supplementary Information	Issued				2019-09-24							
Annual collector output in kWh/co	llector at m	ean flui	d temp	erature	• მ "							
Standard Locations	Athe		<u>.</u>	Davos		St	ockhol	m	V	Vürzbur	g	
Collector name 🐧 🕏 🖽	25°C 50°	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°0	
MTEC-27V	3,574 2,63	2 1,831	2,756	1,989	1,355	2,018	1,377	899	2,196	1,492	959	
MTEC-27H	3,574 2,63	2 1,831	2,756	1,989	1,355	2,018	1,377	899	2,196	1,492	959	
Annual output per m² gross area	1,309 964	671	1,010	729	496	739	505	329	805	547	351	
Fixed or tracking collector	,		ed (slop									
Annual irradiation on collector plane	1765 kW		1714 kWh/m² 1166 kWh									
Mean annual ambient air temperature	18.5	C					7.5°C	9.0°C				
Collector orientation or tracking mode	South,	South, 25° South, 30° South,					outh, 4	5° South, 35°				
The collector is operated at constant te	mperature ປີr	n (mean d	of in- an	d outlet	tempe	ratures)	. The ca	lculatio	n of the	annual		
collector performance is performed witl	n the official :	Solar Keyı	nark spi	eadshe	et tool s	Scenoca	lc Ver. 6	5.0 (Oct	ober 20	18). A d	etaile	
description of the calculations is availab	le at www.so	larkeyma	rk.org/s	cenocal	С							
	А	ddition	al Info	matio	n							
Collector heat transfer medium									Water-	Glycole		
The collector is deemed to be suitable fo	or roof integr	ation								lo .		
The collector was tested successfully un	der the follo	ving cond	litions:									
Climate class (A+, A, B or C)									A	-	-	
$G(W/m^2) > 1000$	ϑ_{a} (°C) :	•		20			H _X (MJ	I/m²) >		60	00	
Maximum tested positive load								30	000	P	'a	
Maximum tested negative load									000	P	'a	
Hail resistance using steel ball (maximur									2	r	n	
	Additi	onal co	<u>llector</u>	<u>attrib</u>	ute(s)							
Using external power source(s) fo		ration	=		•				rotectio			
Co-generating thermal and electric	ical power		\	Vind an	d/or int	rared se	nsitive	collecto	or(s) (WI	SC)		
Façade collector(s)				•								
		gy Labe	iling in	torma								
	Reference Are											
MTEC-27V	2.73	}	{F}-{O}-{CL}-{A:Ø,L}									
MTEC-27H	2.73		{F}-{O}-{CL}-{A:Ø,L}-{C:Ø,L}-{D}									
	2.7.				ני ו	. , . ,						
	2.75											
	2.7				(1)							
	2.7.	'			(1)							
	2.75											
	2.13				(1)							
	2.13				(1)							
			Det				042/5	1012 5				
Data required for CDR (EU) No 811/201	3 - Referenc	e Area			for CDF	R (EU) N	o 812/2		eferenc	e Area	A _{sol}	
Data required for CDR (EU) No 811/201 Collector efficiency (η _{col})	.3 - Referenc 66%	e Area	Zero-lo	ss effici	for CDF ency (η ₍	₹ (EU) N ∂	o 812/2	0.	81	-	-	
Data required for CDR (EU) No 811/201 Collector efficiency (η _{col}) Remark: Collector efficiency (ηcol) is defined	3 - Referenc 66% d in CDR (EU) N	e Area	Zero-lo First-or	ss effici der coe	for CDF ency (η,	R (EU) N⊕	o 812/2	0. 3.	81 61	- W/(ı	- m²K)	
Data required for CDR (EU) No 811/201 Collector efficiency (η _{col}) Remark: Collector efficiency (ηcol) is defined B11/2013 as collector efficiency of the solar	3 - Referenc 66% d in CDR (EU) N collector at a	e Area	Zero-lo First-or Second	ss effici der coe -order	for CDF ency (η _ι efficient coefficie	R (EU) No (a ₁) (a ₁) ent (a ₂)		0. 3. 0.0	81 61 008	-	- m²K)	
Data required for CDR (EU) No 811/201 Collector efficiency (η _{col}) Remark: Collector efficiency (ηcol) is defined B11/2013 as collector efficiency of the solar collector efficiency effi	3 - Referenc 66% d in CDR (EU) N collector at a ollector and the	e Area	Zero-lo First-or Second Inciden	ss effici der coe -order ce angl	for CDF ency (η _i efficient coefficie e modif	R (EU) No. (a ₁) (a ₁) ent (a ₂) ier IAM	(50°)	0. 3. 0.0 0.	81 61 008 93	- W/(r W/(n	- m²K) n²K²) -	
Data required for CDR (EU) No 811/201 Collector efficiency (η _{col}) Remark: Collector efficiency (ηcol) is defined 811/2013 as collector efficiency of the solar collector efficiency eff	3 - Referenc 66% d in CDR (EU) N collector at a ollector and the	e Area	Zero-lo First-or Second Inciden Remark	ss effici der coe -order o ce angle The dat	for CDF ency (η _i efficient coefficie e modif ta given i	R (EU) No. (a ₁) ent (a ₂) ier IAM in this sec	(50°)	0. 3. 0.0 0. related	81 61 008 93 to collect	W/(n W/(n - tor refere	- m²K) n²K²) - ence	
Data required for CDR (EU) No 811/201 Collector efficiency (η _{col}) Remark: Collector efficiency (ηcol) is defined 811/2013 as collector efficiency of the solar temperature difference between the solar cosurrounding air of 40 K and a global solar irraexpressed in % and rounded to the nearest ir	3 - Referenc 66% d in CDR (EU) N collector at a ollector and the idiance of 1000 integer. Deviatir	e Area	Zero-lo First-or Second Inciden Remark area (A	ss effici der coe -order o ce angle : The dat sol) which	for CDF ency (ŋ, efficient coefficie e modif ta given i h is aperi	R (EU) No (a ₁) ent (a ₂) ier IAM in this sec	(50°) tion are for valu	0. 3. 0.0 0. related	81 61 008 93 to collected	- W/(I W/(n - tor refere	- m²K) n²K²) - ence -2 <u>or</u>	
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Data required for CDR (EU) No 811/201 Collector efficiency (η _{col}) Remark: Collector efficiency (ηcol) is defined 811/2013 as collector efficiency of the solar temperature difference between the solar cosurrounding air of 40 K and a global solar irraexpressed in % and rounded to the nearest ir	3 - Referenc 66% d in CDR (EU) N collector at a ollector and the idiance of 1000 integer. Deviatir a (Asol) which	e Area	Zero-lo First-or Second Inciden Remark area (A gross ar area car	ss effici der coe -order o ce anglo : The dat (sol) which ea for IS	for CDF ency (n _i efficient coefficie e modif ta given i h is aperi O 9806. d in calcu	R (EU) No (a ₁) ent (a ₂) ier IAM in this sec ture area Consister	(50°) tion are for valu	0. 3. 0.0 0. related res accorrets for each	81 61 008 93 to collected and to Eding to Eding to Edither ape	W/(I W/(n tor refere N 12975 rture or (m ² K) m ² K ²) - ence -2 or	