

Summary of EN 12975 Test Results						Licence Number		-			
						Issued		-			
Company holding the		PAPAEMMANOUEL S.A.				Countr		Greece			
Brand (optional)						Website		www.papaemmanouel.gr			
Street, street number		1o Km Inofyta – St. Thomas, Inofyta Viotia				E-mail		exports@papaemmanouel.gr			
Postal Code / City,		32011		Viotia		Tel/Fax		30 2262031931			
Collector Type (flat plate glazed/un-glazed; evacuate tubular)						Flat plate collector - glazed					
Thermal / photo voltaic hybrid collector? (PVT collector)						No					
Integration in the roof possible ? (manufacturers declaration)						No					
Collector name	Aperture area (Aa) m <sup>2</sup>	Gross length mm	Gross width mm	Gross height mm	Gross area (AG) m <sup>2</sup>	Power output per collector module G = 1000 W/m <sup>2</sup>					
						Tm-Ta					
						0 K	10 K	30 K	50 K	70 K	
						W	W	W	W	W	
FMAX 1.50	1.38	1,480	1,010	86	1.50	1,145	1,089	964	822	664	
FMAX 1.50H	1.38	1,010	1,480	86	1.50	1,145	1,089	964	822	664	
FMAX 1.82	1.72	1,480	1,230	86	1.82	1,428	1,357	1,202	1,025	828	
FMAX 1.82H	1.72	1,230	1,480	86	1.82	1,428	1,357	1,202	1,025	828	
FMAX 2.00	1.86	1,980	1,010	86	2.00	1,544	1,468	1,299	1,109	895	
FMAX 2.00H	1.86	1,010	1,980	86	2.00	1,544	1,468	1,299	1,109	895	
FMAX 2.37	2.23	1,930	1,230	86	2.37	1,851	1,760	1,558	1,329	1,074	
FMAX 2.37H	2.23	1,230	1,930	86	2.37	1,851	1,760	1,558	1,329	1,074	
FMAX 2.72	2.57	2,160	1,260	86	2.72	2,133	2,028	1,795	1,532	1,237	
FMAX 2.72H	2.57	1,260	2,160	86	2.72	2,133	2,028	1,795	1,532	1,237	
Performance test method						Glazed liquid heating collector - steady state - outdoor					
Performance parameters related to aperture		$\eta_0$	a1	a2							
Units		-	W/(m <sup>2</sup> K)	W/(m <sup>2</sup> K <sup>2</sup> )							
Test results - Flow rate and fluid see note 1		0.830	3.930	0.015							
Bi-directional incidence angle		No	K $\theta$ values are obligatory for 50°.								
Incidence angle modifiers K $\theta$ ( $\theta$ )		Angle	10°	20°	30°	40°	50°	60°	70°	80°	90°
		K $\theta$ ( $\theta$ )					0.96				0.00
Incidence angle modifier not bi-directional - leave fields blank											
Stagnation temperature - Weather conditions see note 2						Tstg	231.09 °C				
Effective thermal capacity						ceff = C/Ag	10.85 kJ/(m <sup>2</sup> K)				
Max. intended operation temperature - see note 3						Tmax,op	200 °C				
Max. operation pressure - see note 3						pmax,op	1000 kPa				
Pressure drop table - for a collector family, the values shall be for the module with highest $\Delta P$ per m <sup>2</sup> aperture area											
Flow rate	kg/(s m <sup>2</sup> )	0.000	0.008	0.013	0.018	0.023	0.028	0.038	0.055		
Pressure drop, $\Delta P$	Pa	0	40	79	116	163	211	335	594		
Optional weather data		Location			Link						
Testing Laboratory		NCSR Demokritos / Solar & other Energy System Laboratory									
Website		www.solar.demokritos.gr									
Test report id. number		4195DE2, 4196DE2, 4197DQ1				Date of test report		16/11/16,30/10/16			
During the test GDF/GTOT was always between		0.05	and	0.09							
Comments of testing laboratory:											
This data sheet issued upon manufacturer request											
Tstg: Calculated using efficiency parameters											
<p style="text-align: center;"><b>NCSR "DEMOKRITOS"</b> SOLAR ENERGY LABORATORY Head: Dr Vasilis Belesiotis Tel: +210 6503819 - Fax: +210 6544992 153 10 Ag. Paraskevi - Attiki - Greece</p>											
Note 1	Flow rate	0.021	kg/(s m <sup>2</sup> )	Fluid	Water						
Note 2	Irradiance, G = 1000 W/m <sup>2</sup> ; Ambient temperature, Ta=30 °C										
Note 3	Given by manufacturer										

Annual collector output based on EN 12975 Test Results	Licence Number	-
	Issued	-

Annual collector output kWh/module												
Collector name	Location and collector temperature (Tm)											
	Athens			Davos			Stockholm			Würzburg		
	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C	25°C	50°C	75°C
FMAX_1.50	1,862	1,329	863	1,411	970	601	1,043	678	404	1,135	735	431
FMAX_1.50H	1,862	1,329	863	1,411	970	601	1,043	678	404	1,135	735	431
FMAX_1.82	2,321	1,656	1,076	1,759	1,210	749	1,301	845	504	1,414	916	537
FMAX_1.82H	2,321	1,656	1,076	1,759	1,210	749	1,301	845	504	1,414	916	537
FMAX_2.00	2,510	1,791	1,164	1,902	1,308	810	1,406	914	545	1,529	991	581
FMAX_2.00H	2,510	1,791	1,164	1,902	1,308	810	1,406	914	545	1,529	991	581
FMAX_2.37	3,009	2,147	1,395	2,281	1,568	971	1,686	1,096	653	1,834	1,188	696
FMAX_2.37H	3,009	2,147	1,395	2,281	1,568	971	1,686	1,096	653	1,834	1,188	696
FMAX_2.72	3,468	2,475	1,608	2,628	1,807	1,119	1,943	1,263	753	2,113	1,369	802
FMAX_2.72H	3,468	2,475	1,608	2,628	1,807	1,119	1,943	1,263	753	2,113	1,369	802

Collector mounting: Fixed or tracking Fixed; slope = latitude - 15° (rounded to nearest 5°)

Overview of locations				
Location	Latitude °	Gtot kWh/m <sup>2</sup>	Ta °C	Collector orientation or tracking mode
Athens	38	1,765	18.5	South, 25°
Davos	47	1,714	3.2	South, 30°
Stockholm	59	1,166	7.5	South, 45°
Würzburg	50	1,244	9.0	South, 35°

Gtot	Annual total irradiation on collector plane	kWh/m <sup>2</sup>
Ta	Mean annual ambient air temperature	°C
Tm	Constant collector operating temperature (mean of in- and outlet temperatures)	°C

The calculation of the annual collector performance is performed with the Keymark spreadsheet tool ScenoCalc (ver. 4.06). The collector output is calculated hour by hour according to the efficiency parameters from the Keymark test using constant collector operating temperature (Tm).