



Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	SKM 10112.2						
Annex to Solar KEYMARK Certificate			Issued	2020-09-10						
Company	PAPAEMMANOUEL S.A.		Country	Greece						
Brand (optional)			Website	www.papaemmanouel.gr						
Street	1o Km Inofyta – St. Thomas, Inofyta Viotia		E-mail	exports@papaemmanouel.gr						
Postal Code	32011	Viotia	Tel. / Fax	+30	22620 31931					
System classification										
Application(s)	Hot water									
Solar loop, circulation principle	Thermosyphon									
Direct solar loop / heat exchanger	Direct									
Open, vented or closed solar loop	Open									
Drain back/down	Always filled (no drain)									
Store location	Outdoor									
Store orientation (of main axis)	Horizontal									
Type of auxiliary heating (internal back-up heat)	None									
If other auxiliary/internal back-up heating, please specify:										
Solar+supplementary OR Solar-only / Solar pre-heat	Solar only / Solar preheat									
Collector(s)			Heat store(s)							
Company	PAPAEMMANOUEL S.A.		Company	PAPAEMMANOUEL S.A.						
Keymark lic.no. if available	SKM 10112.1		Keymark lic.no. if available							
Collector name	Per module			Store name	Total nominal volume	Gross height	Gross width	Gross depth	Auxiliary heated volume	Electrical aux. heating power
	Gross Area (Ag)	Gross length	Gross width							
	m ²	mm	mm							
OLC200	2.00	1980	1010	OLS200	192	1250	580	-	-	-
				OLS300	291	1890	580	-	-	-
Solar loop controller			Solar loop fluid							
Keymark lic.no. if available			Recommended/required	No recommend./requirements						
Company Name			Company Name							
Solar loop pump - power range	W	to	W	Freezing point			°C			
System family overview										
Collector name	Number of collectors in each configuration for each store									
	Store name									
	OLS200		OLS300							
OLC200	1		2							
Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB									
Website	www.solar.demokritos.gr									
Test report id. number	6108 DE1, 6109 DE1, 6109 F1									
Date of test report	20/7/2020, 23/7/2020									
Comments of test lab										
										N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544582 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece



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Postal Code	32011	Viotia	Tel. / Fax	+30 22620 31931									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	OLS200	OLS300											
OLC200	1	2											
Name of system configuration			200OLS200										
Collector name	OLC200	No. Collectors	1	Storage name									
				OLS200									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh MJ/y	Daily drawoff 170 l				Daily drawoff 200 l				Daily drawoff 250 l			
		Qd,hw MJ/y	QL MJ/y	Qpar MJ/y	fsol %	Qd,hw MJ/y	QL MJ/y	Qpar MJ/y	fsol %	Qd,hw MJ/y	QL MJ/y	Qpar MJ/y	fsol %
Stockholm SE	-	9492	3658	0	39	11164	3784	0	34	13939	3910	0	28
WürzburgDE	-	9114	3847	0	42	10691	4037	0	38	13371	4163	0	31
Davos CH	-	10281	5235	0	51	12110	5424	0	45	15137	5550	0	37
Athens GR	-	7064	5014	0	71	8326	5424	0	65	10407	5834	0	56
Perf. indicators for the table above													
Qd,sh	MJ/y	Not relevant for solar domestic hot water system											
Qd	MJ/y	Annual heat demand for domestic hot water											
QL	MJ/y	Annual heat energy delivered by the solar system											
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
$f_{sol}=Q_L/Q_d$	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	G	1,157	1,230	1,684	1,736								
	T _{a,ave}	7.5	9.0	3.2	18.5								
	T _{c,ave}	8.5	10.0	5.4	17.8								
	± ΔTc	6.4	3.0	0.8	7.4								
G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔTc	K	Seasonal variation of Tc											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		700	kPa	Max. operating press. - tank side									
		700	kPa										
Testing Laboratory		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
Website		www.solar.demokritos.gr											
Test report id. number		6108 DE1, 6109 DE1, 6109 F1											
Date of test report		20/7/2020, 23/7/2020											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
		N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544582 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece											

All values are subject to some uncertainty; e.g. the uncertainty on system output is typically in the range of ± 5% to ± 15%

Version 4.5, 2017-10-24



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Postal Code	32011	Viotia	Tel. / Fax	+30 22620 31931									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	OLS200		OLS300										
OLC200	1	2											
Name of system configuration													
			300OLS400										
Collector name	OLC200	No. Collectors	2	Storage name									
Calculated annual results for "solar-only / preheat system"													
Location	Q _{d,sh} MJ/y	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 l			
		Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %	Q _{d,hw} MJ/y	Q _L MJ/y	Q _{par} MJ/y	f _{sol} %
Stockholm SE	-	13939	6623	0	48	16746	7127	0	43	22327	7695	0	34
WürzburgDE	-	13371	6843	0	51	16052	7506	0	47	21413	8105	0	38
Davos CH	-	15137	9808	0	65	18165	10501	0	58	24220	11038	0	46
Athens GR	-	10407	8420	0	81	12488	9461	0	76	16651	10880	0	65
Perf. indicators for the table above													
Q _{d,sh}	MJ/y	Not relevant for solar domestic hot water system											
Q _d	MJ/y	Annual heat demand for domestic hot water											
Q _L	MJ/y	Annual heat energy delivered by the solar system											
Q _{par}	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f _{sol} =Q _L /Q _d	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR								
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G	kWh/m ²	Annual irradiation South, 45°											
T _{a,ave}	°C	Annual average outdoor air temperature											
T _{c,ave}	°C	Annual average mains cold water temp.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		700	kPa	Max. operating press. - tank side		700	kPa						
Testing Laboratory		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
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Test report id. number		6108 DE1, 6109 DE1, 6109 F1											
Date of test report		20/7/2020, 23/7/2020											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
The longterm prediction were extrapolated according to Standard EN 12976-1:2017													
N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544592 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece													

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