



Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar KEYMARK	Registration No. Registernummer Num. d'enregistrement 011-7S1759 A
	Date / Datum / Date 07.11.2011

Company / Firma / Société Street / Straße / Rue Postal Code, Place / PLZ, Ort / Code postal, Place	PAPAEMMANOUEL-SA 1st. Km. Inofyta-St. Thomas 32011 Inofyta-Viotia	Country/Land/Pays Website E-mail Tel.	Greece www.papaemmanouel.gr exports@papaemmanouel.gr +30 226203-1931 / -2166
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System classification / G / F	
Flow principle / G / F	Thermosyphon / G / F
Direct / indirect / G / F	Indirect / G / F
Press. principle / G / F	Closed / G / F
Drain back/down / G / F	No drain (always filled) / G / F
Storage location / G / F	Outdoor / G / F
Storage position / G / F	Horizontal / G / F
Int. back-up / G / F	None / G / F
If other: / G / F	English / Deutsch / Francais
EN12976 type / G / F	Solar only / G / F

Collector(s) / Kollektor(en) / Capteur(s)					Storage(s) / Akkumulator(en) / F					
Company / Hersteller / Manufactuer PAPAEMMANOUEL-SA Keymark reg. no. (optional) 011-7S1674 F					Company / Hersteller / Manufactuer PAPAEMMANOUEL-SA					
Model Bezeichnung Modèle	Per module / G / F				Model Bezeichnung Modèle	Total volume G F litres	Gross diameter/width Diam. / Breite (Außenmaß) Diam. / Largeur hors Tout	Gross length Länge (Außenmaß) longueur hors tout	Back-up heated volume G F litres	El. back-up power G F kW
	Aperture area (Aa) Aperturfläche (Aa) Superficie d'entrée (Aa)	Gross length Länge (Außenmaß) Longueur Hors tout	Gross width Breite (Außenmaß) Largeur hors Tout	No. modules G F min - max						
ASL0580.S86RS-1,50m²	1.38	1.381	1.010	1 - 2	120	120	400	970	0	0
ASL0580.S86RS-1,82m²	1.70	1.480	1.230	1 - 2	150	150	400	1170	0	0
ASL0580.S86RS-2,00m²	1.86	1.936	1.022	1 - 3	200	200	480	1190	0	0
ASL0580.S86RS-2,37m²	2.23	1.930	1.230	1 - 3	300	300	480	1670	0	0

Controller / G / F		Fluid / G / F	
Company/Hersteller/Manufacteur	-	Company/Hersteller/Manufacteur	PAPAEMMANOUEL-SA
Model / Bezeichnung / Modèle	-	Model / Bezeichnung / Modèle	Propylen glycol
Functions G F	-	Freezing point G F	-35 °C

System family overview / G / F												
Collector G F	No. collectors / G / F											
	Storage / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m²	1			1			2			2		
ASL0580.S86RS-2,00m²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m²				1			1			1	2	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / Datum G / date F	02.11.2011

Comments of test lab / Kommentare des Laboratoriums / Commentaires du laboratoire	
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	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1		2	1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-1,50m²	No. collectors	1	Storage type
G		G		G
F		F		F
				120

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	80	110	140	80	110	140	80	110	140	80	110	140
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	4441	6107	7772	2225	2589	2759	0.501	0.424	0.355	0.0	0.0	0.0
Würzburg, DE	4257	5854	7450	2290	2710	2920	0.538	0.463	0.392	0.0	0.0	0.0
Davos, CH	4820	6628	8435	3311	3784	3981	0.687	0.571	0.472	0.0	0.0	0.0
Athens, GR	3305	4545	5784	2760	3404	3875	0.835	0.749	0.670	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
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Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m²	1			1			2			2		
ASL0580.S86RS-2,00m²	1			1		2	1	2		2	3	
ASL0580.S86RS-2,37m²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-1,82m²	No. collectors	1	Storage type
G		G		G
F		F		F
				120

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	80	110	140	80	110	140	80	110	140	80	110	140
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	4441	6107	7772	2380	2852	3101	0.536	0.467	0.399	0.0	0.0	0.0
Würzburg, DE	4257	5854	7450	2427	2950	3263	0.570	0.504	0.438	0.0	0.0	0.0
Davos, CH	4820	6628	8435	3567	4215	4521	0.740	0.636	0.536	0.0	0.0	0.0
Athens, GR	3305	4545	5784	2882	3627	4176	0.872	0.798	0.722	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
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Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m²	1			1			2			2		
ASL0580.S86RS-2,00m²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m²				1			1			1	2	

Name of system konfiguration / G / F												
Collector type G F	ASL0580.S86RS-2,00m²	No. collectors G F	1	Storage type G F	120							

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	80	110	140	80	110	140	80	110	140	80	110	140
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	4441	6107	7772	2447	2962	3249	0.551	0.485	0.418	0.0	0.0	0.0
Würzburg, DE	4257	5854	7450	2478	3044	3405	0.582	0.520	0.457	0.0	0.0	0.0
Davos, CH	4820	6628	8435	3668	4401	4766	0.761	0.664	0.565	0.0	0.0	0.0
Athens, GR	3305	4545	5784	2928	3718	4303	0.886	0.818	0.744	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q _d ; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR		
	G	1 157	1 230	1 684	1 718		
	T _a	7.5	9.0	3.2	18.5		
	T _c	8.5	10.0	5.4	17.8		
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2		

G	kWh/m²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T _c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side G F	300 kPa	Max. operating press. - tank side G F	1000 kPa
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Date of test report / G / F	02.11.2011
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System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-1,50m²	No. collectors	1	Storage type
G		G		G
F		F		F
				150

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	110	140	170	110	140	170	110	140	170	110	140	170
	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	6 107	7 772	9438	2626	2845	2954	0.430	0.366	0.313	0.0	0.0	0.0
Würzburg, DE	5 854	7 450	9047	2745	3002	3130	0.469	0.403	0.346	0.0	0.0	0.0
Davos, CH	6 628	8 435	10243	3831	4091	4230	0.578	0.485	0.413	0.0	0.0	0.0
Athens, GR	4 545	5 784	7024	3431	3945	4298	0.755	0.682	0.612	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1 000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
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System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-1,82m ²	No. collectors	1	Storage type	150
G		G		G	
F		F		F	

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	110	140	170	110	140	170	110	140	170	110	140	170
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	6 107	7 772	9438	2907	3210	3369	0.476	0.413	0.357	0.0	0.0	0.0
Würzburg, DE	5 854	7 450	9047	3003	3367	3564	0.513	0.452	0.394	0.0	0.0	0.0
Davos, CH	6 628	8 435	10243	4295	4673	4865	0.648	0.554	0.475	0.0	0.0	0.0
Athens, GR	4 545	5 784	7024	3668	4263	4720	0.807	0.737	0.672	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	Q _L /Q _d ; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
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	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T _c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G			G		
F			F		

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	Storage type / G / F											
	120			150			200			300		
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ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-2,00m²	No. collectors	1	Storage type
G		G		G
F		F		F
				150

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	110	140	170	110	140	170	110	140	170	110	140	170
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	6 107	7 772	9438	3017	3365	3558	0.494	0.433	0.377	0.0	0.0	0.0
Würzburg, DE	5 854	7 450	9047	3097	3516	3763	0.529	0.472	0.416	0.0	0.0	0.0
Davos, CH	6 628	8 435	10243	4480	4934	5162	0.676	0.585	0.504	0.0	0.0	0.0
Athens, GR	4 545	5 784	7024	3758	4396	4895	0.827	0.760	0.697	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1 000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1		2	1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-2,37m²	No. collectors	1	Storage type
G		G		G
F		F		F
				150

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	110	140	170	110	140	170	110	140	170	110	140	170
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	6 107	7 772	9438	3212	3661	3926	0.526	0.471	0.416	0.0	0.0	0.0
Würzburg, DE	5 854	7 450	9047	3272	3777	4125	0.559	0.507	0.456	0.0	0.0	0.0
Davos, CH	6 628	8 435	10243	4805	5424	5756	0.725	0.643	0.562	0.0	0.0	0.0
Athens, GR	4 545	5 784	7024	3917	4639	5211	0.862	0.802	0.742	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1 000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			1	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-1,50m²	No. collectors	2	Storage type	150
G		G		G	
F		F		F	

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	110			140			170			110			140			170		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	6 107	7 772	9438	3444	4003	4388	0.564	0.515	0.465	0.0	0.0	0.0						
Würzburg, DE	5 854	7 450	9047	3460	4068	4541	0.591	0.546	0.502	0.0	0.0	0.0						
Davos, CH	6 628	8 435	10243	5163	5980	6514	0.779	0.709	0.636	0.0	0.0	0.0						
Athens, GR	4 545	5 784	7024	4077	4911	5598	0.897	0.849	0.797	0.0	0.0	0.0						

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1 000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-2,00m²	No. collectors	1	Storage type
G		G		G
F		F		F
				200

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	200			250			300			200			250			300		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	11 103	13 879	16 655	3842	3997	4047	0.346	0.288	0.243	0.0	0.0	0.0						
Würzburg, DE	10 643	13 304	15 965	4066	4231	4294	0.382	0.318	0.269	0.0	0.0	0.0						
Davos, CH	12 050	15 063	18 075	5519	5709	5766	0.458	0.379	0.319	0.0	0.0	0.0						
Athens, GR	8 263	10 329	12 395	5437	5918	6073	0.658	0.573	0.490	0.0	0.0	0.0						

Perf. indicators G F	Q _d		Heat demand / G / F
	Q _L		System output / G / F
	f _{sol}		QL/Q_d; solar fraction / G / F
	Q _{par}		Elec. for pumps/controllers / G / F

Ref. conditions G F	Stockholm					Würzburg DE					Davos CH					Athens GR					
	G	1 157					1 230					1 684					1 718				
	T _a	7.5					9.0					3.2					18.5				
	T _c	8.5					10.0					5.4					17.8				
	ΔT _c	2.1 - 14.9					7.0 - 13.0					4.6 - 6.2					10.4 - 25.2				

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G		G			
F		F			

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F

Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-2,37m ²	No. collectors	1	Storage type	200
G		G		G	
F		F		F	

Calculated annual results / G / F												
Daily draw-off litres/day / G / F /												
Location G F	200	250	300	200	250	300	200	250	300	200	250	300
	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d	I/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	11 103	13 879	16 655	4297	4497	4563	0.387	0.324	0.274	0.0	0.0	0.0
Würzburg, DE	10 643	13 304	15 965	4534	4763	4853	0.426	0.358	0.304	0.0	0.0	0.0
Davos, CH	12 050	15 063	18 075	6230	6462	6543	0.517	0.429	0.362	0.0	0.0	0.0
Athens, GR	8 263	10 329	12 395	5842	6497	6805	0.707	0.629	0.549	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side			Max. operating press. - tank side		
G	300	kPa	G	1 000	kPa
F			F		

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
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Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-1,50m ²	No. collectors	2	Storage type	200
G		G		G	
F		F		F	

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	200	250	300	200	250	300	200	250	300	200	250	300
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	11 103	13 879	16 655	4908	5218	5329	0.442	0.376	0.320	0.0	0.0	0.0
Würzburg, DE	10 643	13 304	15 965	5109	5508	5651	0.480	0.414	0.354	0.0	0.0	0.0
Davos, CH	12 050	15 063	18 075	7206	7576	7718	0.598	0.503	0.427	0.0	0.0	0.0
Athens, GR	8 263	10 329	12 395	6354	7189	7734	0.769	0.696	0.624	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G			G		
F			F		

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
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		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-1,82m²	No. collectors	2	Storage type
G		G		G
F		F		F
				200

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	200			250			300			200			250			300		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	11 103	13 879	16 655	5529	6037	6279	0.498	0.435	0.377	0.0	0.0	0.0						
Würzburg, DE	10 643	13 304	15 965	5651	6306	6641	0.531	0.474	0.416	0.0	0.0	0.0						
Davos, CH	12 050	15 063	18 075	8242	8932	9200	0.684	0.593	0.509	0.0	0.0	0.0						
Athens, GR	8 263	10 329	12 395	6867	7901	8651	0.831	0.765	0.698	0.0	0.0	0.0						

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1 000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-2,00m ²	No. collectors	2	Storage type	200
G		G		G	
F		F		F	

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	200			250			300			200			250			300		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			QL MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	11 103	13 879	16 655	5352	5774	5979	0.482	0.416	0.359	0.0	0.0	0.0						
Würzburg, DE	10 643	13 304	15 965	5492	6067	6338	0.516	0.456	0.397	0.0	0.0	0.0						
Davos, CH	12 050	15 063	18 075	7941	8510	8712	0.659	0.565	0.482	0.0	0.0	0.0						
Athens, GR	8 263	10 329	12 395	6726	7685	8379	0.814	0.744	0.676	0.0	0.0	0.0						

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q _d ; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T _c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G			G		
F			F		

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-1,50m ²	No. collectors	2	Storage type	300
G		G		G	
F		F		F	

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	250	300	400	250	300	400	250	300	400	250	300	400
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	13879	16655	22206	5468	5729	5951	0.394	0.344	0.268	0.0	0.0	0.0
Würzburg, DE	13304	15965	21286	5761	6067	6322	0.433	0.380	0.297	0.0	0.0	0.0
Davos, CH	15063	18075	24100	7908	8206	8507	0.525	0.454	0.353	0.0	0.0	0.0
Athens, GR	10329	12395	16526	7375	8106	8908	0.714	0.654	0.539	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G			G		
F			F		

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-2,37m²	No. collectors	1	Storage type	300
G		G		G	
F		F		F	

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	250	300	400	250	300	400	250	300	400	250	300	400
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	13879	16655	22206	4663	4846	4996	0.336	0.291	0.225	0.0	0.0	0.0
Würzburg, DE	13304	15965	21286	4949	5141	5322	0.372	0.322	0.250	0.0	0.0	0.0
Davos, CH	15063	18075	24100	6688	6905	7110	0.444	0.382	0.295	0.0	0.0	0.0
Athens, GR	10329	12395	16526	6662	7164	7519	0.645	0.578	0.455	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{bar}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G			G		
F			F		

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1		2	1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-1,82m²	No. collectors	2	Storage type	300
G		G		G	
F		F		F	

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	250			300			400			250			300			400		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	13879	16655	22206	6107	6479	6817	0.440	0.389	0.307	0.0	0.0	0.0						
Würzburg, DE	13304	15965	21286	6359	6833	7216	0.478	0.428	0.339	0.0	0.0	0.0						
Davos, CH	15063	18075	24100	8932	9381	9785	0.593	0.519	0.406	0.0	0.0	0.0						
Athens, GR	10329	12395	16526	7912	8788	9965	0.766	0.709	0.603	0.0	0.0	0.0						

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300 kPa	Max. operating press. - tank side	1 000 kPa
G		G	
F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1		2	1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F				
Collector type	ASL0580.S86RS-2,00m²	No. collectors	2	Storage type
G		G		G
F		F		F
				300

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	250			300			400			250			300			400		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			QL MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	13879	16655	22206	6454	6928	7328	0.465	0.416	0.330	0.0	0.0	0.0	0.0	0.0	0.0			
Würzburg, DE	13304	15965	21286	6678	7248	7769	0.502	0.454	0.365	0.0	0.0	0.0	0.0	0.0	0.0			
Davos, CH	15063	18075	24100	9535	10104	10604	0.633	0.559	0.440	0.0	0.0	0.0	0.0	0.0	0.0			
Athens, GR	10329	12395	16526	8211	9160	10544	0.795	0.739	0.638	0.0	0.0	0.0	0.0	0.0	0.0			

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q_d; solar fraction / G / F
	Q _{bar}	Elec. for pumps/controllers / G / F

Ref. conditions G F	Stockholm					Würzburg DE					Davos CH					Athens GR					
	G	1 157					1 230					1 684					1 718				
	T _a	7.5					9.0					3.2					18.5				
	T _c	8.5					10.0					5.4					17.8				
	ΔT _c	2.1 - 14.9					7.0 - 13.0					4.6 - 6.2					10.4 - 25.2				

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G		G		G	
F		F		F	

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
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Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-1,50m ²	No. collectors	3	Storage type	300
G		G		G	
F		F		F	

Calculated annual results / G / F																		
Location G F	Daily draw-off litres/day / G / F /																	
	250			300			400			250			300			400		
	l/d			l/d			l/d			l/d			l/d			l/d		
	Q _d MJ/a			QL MJ/a			f _{sol}			Q _{par} MJ/a								
Stockholm, SE	13879	16655	22206	6925	7445	7750	0.499	0.447	0.349	0.0	0.0	0.0	0.0	0.0	0.0			
Würzburg, DE	13304	15965	21286	7171	7791	8280	0.539	0.488	0.389	0.0	0.0	0.0	0.0	0.0	0.0			
Davos, CH	15063	18075	24100	10288	10899	11182	0.683	0.603	0.464	0.0	0.0	0.0	0.0	0.0	0.0			
Athens, GR	10329	12395	16526	8573	9556	10940	0.830	0.771	0.662	0.0	0.0	0.0	0.0	0.0	0.0			

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	QL/Q _d ; solar fraction / G / F
	Q _{bar}	Elec. for pumps/controllers / G / F

Ref. conditions G F	Stockholm					Würzburg DE					Davos CH					Athens GR					
	G	1 157					1 230					1 684					1 718				
	T _a	7.5					9.0					3.2					18.5				
	T _c	8.5					10.0					5.4					17.8				
	ΔT _c	2.1 - 14.9					7.0 - 13.0					4.6 - 6.2					10.4 - 25.2				

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G		G			
F		F			

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration	
	Registernummer	011-7S1759 A
	Num. d'enregistrement	
	Date / Datum / Date	07.11.2011

Company / Firma / Société	PAPAEMMANOUEL-SA	Country/Land/Pays	Greece
Street / Straße / Rue	1st. Km. Inofyta-St. Thomas	Website	www.papaemmanouel.gr
Postal Code, Place / PLZ, Ort / Code postal, Place	32011 Inofyta-Viotia	E-mail	exports@papaemmanouel.gr
		Tel. / Fax	+30 226203-1931 / -2166

System family overview / G / F

Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m ²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m ²	1			1			2			2		
ASL0580.S86RS-2,00m ²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m ²				1			1			1	2	

Name of system konfiguration / G / F					
Collector type	ASL0580.S86RS-2,37m ²	No. collectors	2	Storage type	300
G		G		G	
F		F		F	

Calculated annual results / G / F												
Daily draw-off litres/day / G / F /												
Location G F	250	300	400	250	300	400	250	300	400	250	300	400
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	13879	16655	22206	6939	7544	8127	0.500	0.453	0.366	0.0	0.0	0.0
Würzburg, DE	13304	15965	21286	7104	7823	8600	0.534	0.490	0.404	0.0	0.0	0.0
Davos, CH	15063	18075	24100	10318	11134	11833	0.685	0.616	0.491	0.0	0.0	0.0
Athens, GR	10329	12395	16526	8604	9692	11320	0.833	0.782	0.685	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	Q_L/Q_d; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 718
	T _a	7.5	9.0	3.2	18.5
	T _c	8.5	10.0	5.4	17.8
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2

G	kWh/m ²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T_c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side	300	kPa	Max. operating press. - tank side	1 000	kPa
G			G		
F			F		

Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
Website	www.tzs.uni-stuttgart.de
Test report id. number / Prüberichtnummer / F	11SYS87
Date of test report / G / F	02.11.2011
Test method / G / F	ISO 9459-5 (DST)

Comments of test lab / Kommentare des laboratoriums / Commentaires du laboratoire	TZS Stuttgart Pfaffenwaldring 6 70550 Stuttgart
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Summary of EN 12976 Test Results, annex to Solar KEYMARK Certificate Kurzfassung EN 12976 Test Ergebnisse, Anlage zum Solar KEYMARK-Zertifikat Synthèse des résultats d'essais selon EN 12976, Annexe au certificat Solar	Registration Registernummer Num. d'enregistrement Date / Datum / Date	011-7S1759 A 07.11.2011
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Company / Firma / Société Street / Straße / Rue Postal Code, Place / PLZ, Ort / Code postal, Place	PAPAEMMANOUEL-SA 1st. Km. Inofyta-St. Thomas 32011 Inofyta-Viotia	Country/Land/Pays Website E-mail Tel. / Fax	Greece www.papaemmanouel.gr exports@papaemmanouel.gr +30 226203-1931 / -2166
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System family overview / G / F												
Collector type G F	Number of collectors / G / F											
	Storage type / G / F											
	120			150			200			300		
ASL0580.S86RS-1,50m²	1			2	2		2			2	3	
ASL0580.S86RS-1,82m²	1			1			2			2		
ASL0580.S86RS-2,00m²	1			1			1	2		2	3	
ASL0580.S86RS-2,37m²				1			1			1	2	

Name of system konfiguration / G / F												
Collector type G F	ASL0580.S86RS-2,00m²	No. collectors G F	3	Storage type G F	300							

Calculated annual results / G / F												
Location G F	Daily draw-off litres/day / G / F /											
	200	250	300	200	250	300	200	250	300	200	250	300
	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d	l/d
	Q _d MJ/a			Q _L MJ/a			f _{sol}			Q _{par} MJ/a		
Stockholm, SE	13879	16655	22206	7495	8311	9193	0.540	0.499	0.414	0.0	0.0	0.0
Würzburg, DE	13304	15965	21286	7570	8477	9643	0.569	0.531	0.453	0.0	0.0	0.0
Davos, CH	15063	18075	24100	11222	12363	13568	0.745	0.684	0.563	0.0	0.0	0.0
Athens, GR	10329	12395	16526	9038	10312	12279	0.875	0.832	0.743	0.0	0.0	0.0

Perf. indicators G F	Q _d	Heat demand / G / F
	Q _L	System output / G / F
	f _{sol}	Q _L /Q _d ; solar fraction / G / F
	Q _{par}	Elec. for pumps/controllers / G / F

Ref. conditions G F		Stockholm	Würzburg DE	Davos CH	Athens GR		
	G	1 157	1 230	1 684	1 718		
	T _a	7.5	9.0	3.2	18.5		
	T _c	8.5	10.0	5.4	17.8		
	ΔT _c	2.1 - 14.9	7.0 - 13.0	4.6 - 6.2	10.4 - 25.2		

G	kWh/m²	Annual irradiation South, 45° / G / F
T _a	°C	Annual mean air temp. / G / F
T _c	°C	Annual mean cold water temp. / G / F
ΔT _c	°C	Seasonal variation of T _c / G / F
T _h	45°C	Desired (mix. valve) temp. / G / F

Max. operating press. - collector side G F	300 kPa	Max. operating press. - tank side G F	1 000 kPa
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Testing Laboratory / Prüflaboratorium / Laboratoire d'essais	TZS, ITW University of Stuttgart
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