



Certificado

Certificate no.
Certificado nº

PSK – 002/2016



Name and address of certificate holder:
Nome e morada do titular do certificado:

SOLE S. A.
Lefktron and Laikon Agonon,
Acharnai – 13671, Athens
GREECE

Product:
Produto:

Thermal solar system and components – Factory made
system
Instalação solar térmica pré-fabricada e seus componentes

Type references:

125-1-S150; 125-1-S200; 150-1-S200; 150-1-S230; 150-2-S150;
200-1-S200; 200-1-S230; 200-1-S260; 200-2-S200; 300-2-S200;
300-2-S230

Referências:

Trademark(s):
Marca(s) comercial(is):

EUROSTAR ECO, HELIOTHERMO ECO

Technical characteristics:
Características técnicas:

Summary of EN 12976 Test Results: *Registration No. PSK-002/2016,*
(in annex)
Resumo dos resultados dos ensaios realizados segundo a norma EN 12976:
Registo Nº PSK-002/2016, (em anexo)

This product is in conformity with:
Este produto está em conformidade com:

EN 12976-1:2006, EN 12976-2:2006

and with the Specific Keymark Scheme Rules for Solar Thermal Products
e com as Regras Particulares do CEN Keymark Scheme para Produtos Solares Térmicos.

Test report(s) no. / issued by:
Relatórios de ensaios nº(s) / emitidos por:

Nº 6075DE2, 6076DE2, 6075F1 / DEMOKRITOS

Additional information (if any):
Informação adicional (se existir):

This certificate is valid until:
Este certificado é válido até:
and supersedes certificate no:
e substitui o certificado nº:

2020-12-13

PSK-025/2015

Date of issue:
Data de emissão:

2016-01-04

Francisco Barroca
General Manager / Diretor Geral

This Certificate includes one Annex with 12 (twelve) pages
Este Certificado é constituído por um Anexo com 12 (doze) páginas





Summary of		EN12976-2		SOLAR SYSTEM test results		Licence Number		PSK-002/2016					
Annex to Solar KEYMARK Certificate						Issued		2016-01-04					
Company		SOLE SA				Country		GREECE					
Brand (optional)		EUROSTAR ECO, HELIOTHERMO ECO				Website		www.eurostar-solar.com					
Street		LEFKTRON & LAIKON AGONON				E-mail		export@sole.com					
Postal Code		13671		ACHARNAI, ATHENS		Tel. / Fax		+30 2102389500 / 2					
System classification													
Application(s)					Hot water								
Solar loop, circulation principle					Thermosyphon								
Direct solar loop / heat exchanger					Heat exchanger								
Open, vented or closed solar loop					Closed								
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		SOLE SA			Company		SOLE SA						
Keymark lic.no. if available		PSK-001/2016			Keymark lic.no. if available		-						
Collector name		Per module			Store name		Total nominal volume litres Gross height mm Gross width mm Gross depth mm Auxiliary heated volume litres Electrical aux. heating power kW						
		Gross Area (Ag) m ²	Gross length mm	Gross width mm									
ECO S260		2.64	2135	1238	125		115	1000	400	400	-	-	
ECO S230		2.28	1960	1165	150		142	1040	440	440	-	-	
ECO S200		1.88	1960	960	200		170	1065	480	480	-	-	
ECO S150		1.48	1540	960	300		276	1765	450	450	-	-	
Solar loop controller					Solar loop fluid								
Keymark lic.no. if available		-			Recommended/required		Required						
Company		-			Company		-						
Name		-			Name		Propylenoglycol						
Solar loop pump - power range		- W to - W			Freezing point		-15 °C						
System family overview													
Collector name		Number of collectors in each configuration for each store											
		Store name											
		125			150			200			300		
ECO S260									1				
ECO S230						1			1			2	
ECO S200			1			1				2		2	
ECO S150			1				2						
Testing Laboratory					Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"								
Website					www.solar.demokritos.gr								
Test report id. number					6075DE2, 6076DE2, 6075F1								
Date of test report					2015-12-03, 2015-12-03, 2015-10-20								
Comments of test lab					N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vasilis Belesiotis Tel: +210 6503915 - Fax: +210 6544539 163 10 Ag. Paraskevi - Attiki - Greece								

Summary of	EN12976-2	test results	Certification No.	PSK-002/2016									
Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com									
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration													
Collector name	ECO S150	No. Collectors	1	Storage name									
125-S150													
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 80				Daily drawoff 110				Daily drawoff 140			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
		MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	0	4478	1949	-	44	6150	2255	-	37	7821	2416	-	31
Würzburg DE	0	4289	2028	-	47	5897	2372	-	40	7506	2592	-	35
Davos CH	0	4857	2870	-	59	6654	3280	-	49	8483	3532	-	42
Athens GR	0	3343	2567	-	77	4573	3147	-	69	5834	3595	-	62
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								
	± ΔT _c	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.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
No comments													

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

Version 3.6, 2014-06-18



Associação para a Certificação



NCSR "DEMOKRITOS"

Solar & other Energy Systems Laboratory

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Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
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Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration 125-1-S200													
Collector name	ECO S200	No. Collectors	1	Storage name									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh MJ/y	Daily drawoff 80 l				Daily drawoff 110 l				Daily drawoff 140 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	0	4478	2148	-	48	6150	2532	-	41	7821	2740	-	35
Würzburg DE	0	4289	2208	-	52	5897	2646	-	45	7506	2939	-	39
Davos CH	0	4857	3217	-	66	6654	3721	-	56	8483	4068	-	48
Athens GR	0	3343	2718	-	82	4573	3406	-	74	5834	3910	-	67
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} = QL/Qd	-	Solar fraction											
Ref. conditions	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	Ta,ave	7.5	9.0	3.2	18.5								
	Tc,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°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,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		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab		No comments											

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Version 3.6, 2014-06-18

CERTIF Associação para a Certificação

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Summary of	EN12976-2	test results	Certification No.	PSK-002/2016									
Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com									
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125		150										
ECO S260				1									
ECO S230		1		1									
ECO S200	1	1	1	2									
ECO S150	1		2										
Name of system configuration													
Collector name			No. Collectors	Storage name									
ECO S200			1	150-1-S200									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 110				Daily drawoff 140				Daily drawoff 170			
		Qd,hw	Q_L	Q_{par}	f_{sol}	Qd,hw	Q_L	Q_{par}	f_{sol}	Qd,hw	Q_L	Q_{par}	f_{sol}
		MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	0	6150	2545	-	42	7821	2778	-	36	9492	2933	-	31
Würzburg DE	0	5897	2658	-	45	7506	2968	-	40	9114	3185	-	35
Davos CH	0	6654	3721	-	56	8483	4100	-	48	10281	4352	-	42
Athens GR	0	4573	3406	-	75	5834	3974	-	68	7064	4384	-	62
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											
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								
	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								
	± ΔT _c	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.											
ΔT _c	K	Seasonal variation of T _c											
T _h	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
No comments													

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Solar & other Energy Systems Laboratory

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Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration													
Collector name	ECO S230	No. Collectors	1	Storage name									
				150									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 110				Daily drawoff 140				Daily drawoff 170			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	0	6150	2763	-	45	7821	3046	-	39	9492	3248	-	34
WürzburgDE	0	5897	2867	-	49	7506	3248	-	43	9114	3500	-	39
Davos CH	0	6654	4100	-	62	8483	4541	-	54	10281	4857	-	47
Athens GR	0	4573	3595	-	79	5834	4226	-	72	7064	4699	-	67
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								
	± ΔT _c	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.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
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Comments of test lab													
No comments													

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Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration													
Collector name	ECO S150	No. Collectors	2	Storage name									
150-2-S150													
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff				Daily drawoff				Daily drawoff			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	0	6150	2980	-	49	7821	3311	-	43	9492	3564	-	38
Würzburg DE	0	5897	3062	-	52	7506	3532	-	47	9114	3879	-	43
Davos CH	0	6654	4447	-	67	8483	5014	-	59	10281	5393	-	52
Athens GR	0	4573	3753	-	82	5834	4447	-	76	7064	5014	-	71
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								
	Ta,ave	7.5	9.0	3.2	18.5								
	Tc,ave	8.5	10.0	5.4	17.8								
	$\pm \Delta T_c$	6.4	3.0	0.8	7.4								
G	kWh/m ²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,ave	°C	Annual average mains cold water temp.											
ΔT_c	K	Seasonal variation of Tc											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
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No comments													

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System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration													
Collector name	ECO S200	No. Collectors	1	Storage name									
200-1-S200													
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 140 l				Daily drawoff 170 l				Daily drawoff 200 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	
Stockholm SE	0	7821	2804	-	36	9492	2980	-	31	11164	3106	-	28
Würzburg DE	0	7506	2986	-	40	9114	3217	-	35	10691	3406	-	32
Davos CH	0	8483	4100	-	48	10281	4384	-	43	12110	4573	-	38
Athens GR	0	5834	3974	-	68	7064	4415	-	63	8326	4762	-	57
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								
	Ta,ave	7.5	9.0	3.2	18.5								
	Tc,ave	8.5	10.0	5.4	17.8								
	$\pm \Delta T_c$	6.4	3.0	0.8	7.4								
G	kWh/m ²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,ave	°C	Annual average mains cold water temp.											
ΔT_c	K	Seasonal variation of Tc											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
No comments													
N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +210 8503815 - Fax: +210 8544000 153 10 Ag. Paraskevi - Attiki - Greece													

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

Version 3.6, 2014-06-18



Summary of	EN12976-2	test results	Certification No.	PSK-002/2016									
Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com									
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration 200-1-S230													
Collector name	ECO S230	No. Collectors	1	Storage name 200									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh	Daily drawoff 140 l				Daily drawoff 170 l				Daily drawoff 200 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
	MJ/y	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	0	7821	3091	-	40	9492	3311	-	35	11164	3469	-	31
Würzburg DE	0	7506	3280	-	44	9114	3564	-	39	10691	3784	-	35
Davos CH	0	8483	4573	-	54	10281	4920	-	48	12110	5172	-	43
Athens GR	0	5834	4257	-	73	7064	4762	-	67	8326	5203	-	62
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								
	Ta,ave	7.5	9.0	3.2	18.5								
	Tc,ave	8.5	10.0	5.4	17.8								
	± ΔTc	6.4	3.0	0.8	7.4								
G	kWh/m²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,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		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
No comments													

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Version 3.6, 2014-06-18

CERTIF Associação para a Certificação

Rua José Afonso, 9E - 2810-237 Almada - Portugal

Tel: +351 212 586 940 / Fax: +351 212 586 959 / mail@certif.pt / www.certif.pt

Summary of	EN12976-2	test results	Certification No.	PSK-002/2016									
Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com									
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration 200-1-S260													
Collector name	ECO S260	No. Collectors	1	Storage name									
Calculated annual results for "solar-only / preheat system"													
Location	Q _{d,sh} MJ/y	Daily drawoff 140 l				Daily drawoff 170 l				Daily drawoff 200 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	0	7821	3138	-	40	9492	3374	-	36	11164	3595	-	32
Würzburg DE	0	7506	3280	-	44	9114	3595	-	40	10691	3816	-	36
Davos CH	0	8483	4541	-	53	10281	4857	-	47	12110	5109	-	42
Athens GR	0	5834	4257	-	73	7064	4762	-	67	8326	5172	-	62
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								
	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								
± ΔT _c	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.											
ΔT _c	K	Seasonal variation of T _c											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab													
No comments													

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Version 3.6, 2014-06-18



Summary of	EN12976-2	test results	Certification No.	PSK-002/2016										
Annex to Solar KEYMARK Certificate			Issued	2016-01-04										
Company	SOLE SA		Country	GREECE										
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com										
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com										
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2										
System family overview														
For each storage and collector size, give number of collectors														
Collector name	125	150	200	300										
ECO S260			1											
ECO S230		1	1	2										
ECO S200	1	1	2											
ECO S150	1	2												
Name of system configuration														
ECO S200			200-2-S200											
Collector name	ECO S200		No. Collectors	2										
		Storage name		200										
Calculated annual results for "solar-only / preheat system"														
Location	Qd,sh MJ/y	Daily drawoff 140 l				Daily drawoff 170 l				Daily drawoff 200 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	0	7821	3595	-	46	9492	3910	-	41	11164	4131	-	37	
Würzburg DE	0	7506	3784	-	50	9114	4194	-	46	10691	4510	-	42	
Davos CH	0	8483	5456	-	64	10281	5929	-	58	12110	6307	-	52	
Athens GR	0	5834	4667	-	80	7064	5330	-	75	8326	5897	-	71	
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									
	± ΔT _c	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.												
ΔT _c	K	Seasonal variation of T _c												
Th	45 °C	Desired hot water temperature (mixing valve temperature).												
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa							
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"												
Website		www.solar.demokritos.gr												
Test report id. number		6075DE2, 6076DE2, 6075F1												
Date of test report		2015-12-03, 2015-12-03, 2015-10-20												
Test method		ISO 9459-5 (DST)												
Comments of test lab		No comments												
		N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +210 8503815 - Fax: +210 8544500 153 10 Ag. Paraskevi - Attiki - Greece												

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Summary of	EN12976-2	test results	Certification No.	PSK-002/2016									
Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com									
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 /2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	2	2									
ECO S150	1	2											
Name of system configuration													
300-2-S200													
Collector name	ECO S200	No. Collectors	2	Storage name									
300													
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh MJ/y	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 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	0	13939	5456	-	39	16746	5771	-	35	22327	6307	-	28
Würzburg DE	0	13371	5803	-	44	16052	6276	-	39	21413	6686	-	31
Davos CH	0	15137	8105	-	54	18165	8641	-	48	24220	9177	-	38
Athens GR	0	10407	7537	-	73	12488	8389	-	67	16651	9429	-	57
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								
	Ta,ave	7.5	9.0	3.2	18.5								
	Tc,ave	8.5	10.0	5.4	17.8								
	$\pm \Delta T_c$	6.4	3.0	0.8	7.4								
G	kWh/m ²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,ave	°C	Annual average mains cold water temp.											
ΔT_c	K	Seasonal variation of Tc											
Th	45 °C	Desired hot water temperature (mixing valve temperature).											
Max. operating press. - collector side		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab		No comments											
		N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +210 8543815 - Fax: +210 8544502 153 10 Ag. Paraskevi - Attiki - Greece											

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Summary of	EN12976-2	test results	Certification No.	PSK-002/2016									
Annex to Solar KEYMARK Certificate			Issued	2016-01-04									
Company	SOLE SA		Country	GREECE									
Brand (optional)	EUROSTAR ECO, HELIOTHERMO ECO		Website	www.eurostar-solar.com									
Street	LEFKTRON & LAIKON AGONON		E-mail	export@sole.com									
Postal Code	13671	ACHARNAI, ATHENS	Tel. / Fax	+30 2102389500 / 2									
System family overview													
For each storage and collector size, give number of collectors													
Collector name	125	150	200	300									
ECO S260			1										
ECO S230		1	1	2									
ECO S200	1	1	1	2									
ECO S150	1	2											
Name of system configuration													
Collector name			300-2-S230										
ECO S230		No. Collectors	2	Storage name									
				300									
Calculated annual results for "solar-only / preheat system"													
Location	Qd,sh MJ/y	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 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	0	13939	5929	-	42	16746	6307	-	38	22327	6938	-	31
Würzburg DE	0	13371	6276	-	47	16052	6812	-	43	21413	7348	-	34
Davos CH	0	15137	8893	-	59	18165	9524	-	52	24220	10186	-	42
Athens GR	0	10407	7947	-	76	12488	8893	-	71	16651	10155	-	61
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} = QL / Qd	-	Solar fraction											
Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	G	1,157	1,230	1,684	1,736								
	Ta,ave	7.5	9.0	3.2	18.5								
	Tc,ave	8.5	10.0	5.4	17.8								
	± ΔTc	6.4	3.0	0.8	7.4								
G	kWh/m²	Annual irradiation South, 45°											
Ta,ave	°C	Annual average outdoor air temperature											
Tc,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		250	kPa	Max. operating press. - tank side		1000	kPa						
Testing Laboratory		Solar & Energy Systems Laboratory, NCSR "DEMOKRITOS"											
Website		www.solar.demokritos.gr											
Test report id. number		6075DE2, 6076DE2, 6075F1											
Date of test report		2015-12-03, 2015-12-03, 2015-10-20											
Test method		ISO 9459-5 (DST)											
Comments of test lab		No comments											
		N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belessiotis Tel: +210 6505515 - Fax: +210 6544500 153 10 Ag. Paraskevi - Attiki - Greece											

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