Certificado

Certificate no.
Certificado nº **PSK-009/2020**

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: *Referências:*	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
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:*	2025-12-13
and supersedes certificate no: *e substitui o certificado nº:*	-----
Date of issue: *Data de emissão:*	2020-12-14

Francisco Barroca
General Manager / *Diretor Geral*

IPAC acreditação
2000
ISO/IEC 17065
Produtos

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

Certif – Associação para a Certificação
Rua José Afonso, 9 E – 2810-237 Almada – Portugal – Tel.: 351. 21 258 69 40 – Fax: 351. 21 258 69 59

Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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 specifiy:	
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-008/2020*			*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							
	m²	mm	mm		litres	mm	mm	mm	litres	kW
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							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	
Comments ...	N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6644592 P.O. BOX 60037, 15310 Ag. Paraskevi, Greece

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-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																													
	125						150						200						300											
ECO S260															1															
ECO S230								1						1						2										
ECO S200		1					1						1			2			2											
ECO S150	1								2																					

Name of system configuration			125-1-S150
Collector name	ECO S150	No. Collectors	1	Storage name	125

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 80 l				Daily drawoff 110 l				Daily drawoff 140 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	4478	1949	-	44	6150	2255	-	37	7821	2416	-	31
WürzburgDE	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			
	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	
	N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544592 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

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors			
	125	150	200	300
ECO S260			1	
ECO S230		1	1	2
ECO S200	1	1	1 2	2
ECO S150	1	2		

Name of system configuration				125-1-S200	
Collector name	ECO S200	No. Collectors	1	Storage name	125

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 80 l				Daily drawoff 110 l				Daily drawoff 140 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	4478	2148	-	48	6150	2532	-	41	7821	2740	-	35
WürzburgDE	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)
$f_{sol}=Q_L/Q_d$	-	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	
	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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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																													
	125						150						200						300											
ECO S260													1																	
ECO S230							1						1						2											
ECO S200		1					1						1			2			2											
ECO S150	1								2																					

Name of system configuration				150-1-S200	
Collector name	ECO S200	No. Collectors	1	Storage name	150

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff		110 l		Daily drawoff		140 l		Daily drawoff		170 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	6150	2545	-	42	7821	2778	-	36	9492	2933	-	31
WürzburgDE	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
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

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P.O. BOX 60037, 15310 Ag. Paraskevi, Greece

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																											
	125						150						200						300											
ECO S260														1														
ECO S230								1						1						2								
ECO S200		1					1						1			2			2									
ECO S150	1								2																			

Name of system configuration						150-1-S230	
Collector name	ECO S230	No. Collectors	1	Storage name	150		

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 110 l				Daily drawoff 140 l				Daily drawoff 170 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	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			
	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	
	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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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																													
	125						150						200						300												
ECO S260															1															
ECO S230								1						1						2										
ECO S200		1					1						1			2			2											
ECO S150	1								2																					

Name of system configuration					150-2-S150		
Collector name	ECO S150	No. Collectors	2		Storage name	150	

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 110 l				Daily drawoff 140 l				Daily drawoff 170 l			
		Qd,hw	Q_L	Qpar	fsol	Qd,hw	Q_L	Qpar	fsol	Qd,hw	Q_L	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	6150	2980	-	49	7821	3311	-	43	9492	3564	-	38
WürzburgDE	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
Q_L	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	
	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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Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																																	
	125						150						200						300																	
ECO S260															1																				
ECO S230								1						1						2															
ECO S200		1					1						1			2			2																
ECO S150	1								2																										

Name of system configuration								200-1-S200			
Collector name	ECO S200			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	2804	-	36	9492	2980	-	31	11164	3106	-	28
WürzburgDE	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			
	± 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	
	N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Tel: +210 6503815 - Fax: +210 6544592 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

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																															
	125						150						200						300														
ECO S260															1																	
ECO S230								1						1						2												
ECO S200		1					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
WürzburgDE	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		Stöckholm 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

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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	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	3138	-	40	9492	3374	-	36	11164	3595	-	32
WürzburgDE	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

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

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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					200-2-S200	
Collector name	ECO S200	No. Collectors	2	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	Q_L	Qpar	fsol	Qd,hw	Q_L	Qpar	fsol	Qd,hw	Q_L	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	3595	-	46	9492	3910	-	41	11164	4131	-	37
WürzburgDE	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
Q_L	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	
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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																													
	125						150						200						300											
ECO S260														1																
ECO S230								1						1						2										
ECO S200		1					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	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 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	13939	5456	-	39	16746	5771	-	35	22327	6307	-	28
WürzburgDE	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			
	± 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
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Comments of test lab

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	PSK-009/2020
Annex to Solar KEYMARK Certificate			Issued	2020-12-14

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

Collector name	For each storage and collector size, give number of collectors																											
	125						150						200						300											
ECO S260														1														
ECO S230								1						1						2								
ECO S200		1					1						1			2			2									
ECO S150	1								2																			

Name of system configuration					
Collector name	ECO S230	No. Collectors	2	Storage name	300

Calculated annual results for "solar-only / preheat system"

Location	Qd,sh	Daily drawoff 250 l				Daily drawoff 300 l				Daily drawoff 400 l			
		Qd,hw	Q_L	Qpar	fsol	Qd,hw	Q_L	Qpar	fsol	Qd,hw	Q_L	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	13939	5929	-	42	16746	6307	-	38	22327	6938	-	31
WürzburgDE	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
Q_L	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
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