CERTIFICATE OF CONFORMITY

Certificate No SKM 10043.2

DQS Hellas grants the present certificate to the enterprise:

SONNE AKTION LTD
39 Chalkidikis, 14451 Metamorfosi

for the product:

Solar systems family:
ATLAS ST12, ATLAS STL12, ATLAS ST15, ATLAS STE15, ATLAS ST16, ATLAS STE16, ATLAS STL16, ATLAS ST20, ATLAS STE20, ATLAS STEE20, ATLAS STL20, ATLAS ST30, ATLAS STL30

which is produced in conformity with the normative document:

EN 12976-1:2017
EN 12976-2:2017
EN 12975-1:2011
EN ISO 9806:2013

at the following location:

68 Km N.R. Athens - Lamia
32009 Schimatari Viotias

The present certificate is granted in accordance with:

- *the DQS Hellas General Rules for the Certification of Products,*
- *the Specific Rule for Certification ΕΚΠΠ.001 «Specific Rule for Certification of Solar Collectors, and Thermal Solar Heating Systems for Domestic Hot Water»,*

and is ruled by the terms of the relevant contract between DQS Hellas and the enterprise.

Date of issue: ***2024-09-10***
Date of valid: ***2027-09-10***

Panagiotis Giannoutsos
Director of Certification

Dr. Emmanuel Deliyannakis
Managing Director

Products Certification
Cert. No 735

Accredited Body: 2, Kalavriton Street, 14564 Kifissia - Athens, Greece

ΓΚΠΠ-08 – 15/12/2014

CERTIFICATION
LICENCE TO USE KEYMARK

Certificate No SKM 10043.2

DQS Hellas grants the present certificate to the enterprise:

SONNE AKTION LTD
39 Chalkidikis, 14451 Metamorfosi

for the product:

Solar systems family:
ATLAS ST12, ATLAS STL12, ATLAS ST15, ATLAS STE15, ATLAS ST16, ATLAS STE16, ATLAS STL16, ATLAS ST20, ATLAS STE20, ATLAS STEE20, ATLAS STL20, ATLAS ST30, ATLAS STL30

which is produced in conformity with the normative document:

EN 12976-1:2017
EN 12976-2:2017
EN 12975-1:2011
EN ISO 9806:2013

at the following location:

68 Km N.R. Athens - Lamia
32009 Schimatari Viotias

E 31

The present certificate is granted in accordance with:

- *the DQS Hellas General Rules for the Certification of Products,*
- *the Specific Rule for Certification ΕΚΠΠ.001 «Specific Rule for Certification of Solar Collectors, and Thermal Solar Heating Systems for Domestic Hot Water»,*
- *the Specific CEN Keymark Scheme Rules for Solar Thermal Products,*

and is ruled by the terms of the relevant contract between DQS Hellas and the enterprise.

Date of issue: ***2024-09-10***
Date of valid: ***2027-09-10***

Panagiotis Giannoutsos
Director of Product Certification

Dr. Emmanuel Deliyannakis
Managing Director

Notified Body: 2, Kalavriton Street, 14564 Kifisia - Athens, Greece

EEK.001-07 – 10/11/2011

Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	2,351,037,257

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)	Electric
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	SONNE AKTION LTD	Company	SONNE AKTION LTD
Keymark lic.no. if available	*SKM 10078*	*Keymark lic.no. if available*	

Collector name	Per module			Store name	Total nominal volume	Gross height	Gross width	Gross depth	Auxiliary heated volume	Electrical aux. heating power
	Gross Area (Ag)	Gross length	Gross width							
	m^2	mm	mm		litres	mm	mm	mm	litres	kW
ATLAS CA160	1.60	1570	1020	T12	115	1120	500	-	-	1.2-4.5
ATLAS CA200	1.90	1970	965	T15	142	1320	500	-	-	1.2-4.5
ATLAS CA230	2.30	1970	1165	T16	154	1130	580	-	-	1.2-4.5
				T20	194	1320	580	-	-	1.2-4.5
				T30	292	1830	580	-	-	1.2-4.5

Solar loop controller		Solar loop fluid	
Keymark lic.no. if available		Recommended/required	No recommend./requirements
Company		Company	
Name		Name	
Solar loop pump - power range	W to W	Freezing point	-4 °C

System family overview

Collector name	Number of collectors in each configuration for each store																									
	Store name																									
	T12						T15						T16						T20						T30					
ATLAS CA160	1													2					2											
ATLAS CA200		1					1						1							1		2				2				
ATLAS CA230								1						1							1				2					

Testing Laboratory	NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017

Comments of test lab	
Comments ...	N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belessiotis Tel: +210 6503815 - Fax: +210 6544596 153 10 Ag. Paraskevi - Attiki - Greece

DQS HELLAS Ltd, Central Offices: Kalavriton 4, 145 64 kifisia, Athens, Tel: +301 6233493-4 , Fax: +301 6233495,
http://www.dqshellas.gr, e-mail: ioannisalexiou@dqshellas.gr

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2				2				
ATLAS CA230								1						1							1						2			

Name of system configuration					ATLAS ST12		
Collector name	ATLAS CA160	No. Collectors	1		Storage name	T12	

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	-	4478	2340	-	52	6150	2794	-	46	7821	2999	-	38
WürzburgDE	-	4289	2384	-	56	5897	2882	-	49	7506	3154	-	42
Davos CH	-	4857	3469	-	72	6654	4037	-	61	8483	4289	-	51
Athens GR	-	3343	2851	-	86	4573	3595	-	78	5834	4100	-	70

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 6503615 - Fax: +210 6544592
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 ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS STL12	
Collector name	ATLAS CA200	No. Collectors	1	Storage name	T12

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	-	4478	2498	-	56		6150	3043	-	50		7821	3343	-	43	
WürzburgDE	-	4289	2517	-	59		5897	3106	-	53		7506	3469	-	46	
Davos CH	-	4857	3721	-	77		6654	4478	-	67		8483	4825	-	57	
Athens GR	-	3343	2961	-	89		4573	3784	-	83		5834	4384	-	75	

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 6503815 - Fax: +210 6544596
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 ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS ST15	
Collector name	ATLAS CA230	No. Collectors	1	Storage name	T15

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

Location	Qd,sh	Daily drawoff	110			Daily drawoff	140			Daily drawoff	170		
		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	-	6150	3280	-	54	7821	3784	-	48	9492	4068	-	43
WürzburgDE	-	5897	3343	-	57	7506	3879	-	52	9114	4226	-	47
Davos CH	-	6654	4888	-	73	8483	5550	-	66	10281	5897	-	57
Athens GR	-	4573	3974	-	87	5834	4730	-	82	7064	5330	-	76

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 6503815 Fax: +210 6544572
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 ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS STE15	
Collector name	ATLAS CA200	No. Collectors	1	Storage name	T15

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

Location	Qd,sh	Daily drawoff	110			Daily drawoff	140			Daily d	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	MJ/y	%
Stockholm SE	-	6150	3031	-	49	7821	3406	-	44	9492	3627	-	38
WürzburgDE	-	5897	3106	-	53	7506	3564	-	47	9114	3816	-	42
Davos CH	-	6654	4447	-	67	8483	4951	-	58	10281	5172	-	50
Athens GR	-	4573	3784	-	83	5834	4447	-	77	7064	4951	-	70

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 6503815 - Fax: +210 6544592
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 ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1													2					2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS ST16	
Collector name	ATLAS CA230	No. Collectors	1	Storage name	T16

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

Location	Qd,sh	Daily drawoff	110	l			Daily drawoff	140	l		Daily d	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	-	6150	3311	-	54		7821	3784	-	49	9492	4131	-	44	
WürzburgDE	-	5897	3343	-	57		7506	3910	-	52	9114	4289	-	47	
Davos CH	-	6654	4888	-	74		8483	5582	-	66	10281	5992	-	58	
Athens GR	-	4573	3974	-	87		5834	4762	-	82	7064	5393	-	76	

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 6503815 - Fax: +210 6544592
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 ± 5 % to ± 15 %

Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																													
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS STE16	
Collector name	ATLAS CA200	No. Collectors	1	Storage name	T16

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

Location	Qd,sh	Daily drawoff	110	l			Daily drawoff	140	l		Daily d	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	-	6150	3027	-	49		7821	3437	-	44	9492	3658	-	39	
WürzburgDE	-	5897	3113	-	53		7506	3564	-	48	9114	3847	-	42	
Davos CH	-	6654	4447	-	67		8483	4951	-	58	10281	5235	-	51	
Athens GR	-	4573	3784	-	83		5834	4447	-	77	7064	4983	-	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			
	± 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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

Company	SONNE AKTION LTD		Country	Greece	
Brand (optional)	ATLAS		Website	www.sonne.gr	
Street	68 Km N.R. Athens - Lamia		E-mail	info@sonne.gr	
Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1												2						2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS STL16	
Collector name	ATLAS CA160	No. Collectors	2	Storage name	T16

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

Location	Qd,sh	Daily drawoff	110			Daily drawoff	140			Daily d	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	MJ/y	%
Stockholm SE	-	6150	3658	-	60	7821	4320	-	55	9492	4825	-	51
WürzburgDE	-	5897	3658	-	62	7506	4352	-	58	9114	4920	-	54
Davos CH	-	6654	5487	-	83	8483	6433	-	76	10281	7127	-	69
Athens GR	-	4573	4226	-	92	5834	5140	-	88	7064	5929	-	84

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
Test method	ISO 9459-5 (DST)

Comments of test lab

No comments

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System family overview

Collector name	For each storage and collector size, give number of collectors																													
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS ST20	
Collector name	ATLAS CA160	No. Collectors	2	Storage name	T20

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

Location	Qd,sh	Daily drawoff	170	l	Daily drawoff	200	l	Daily d	250	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	-	9492	4920	-	52	11164	5330	-	48	13939	5708	-	41		
WürzburgDE	-	9114	5014	-	55	10691	5487	-	51	13371	5992	-	45		
Davos CH	-	10281	7253	-	71	12110	7852	-	65	15137	8231	-	54		
Athens GR	-	7064	5992	-	85	8326	6717	-	81	10407	7632	-	73		

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
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Comments of test lab

No comments

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
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Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							**1**					2				

Name of system configuration				ATLAS STE20	
Collector name	ATLAS CA230	No. Collectors	1	Storage name	T20

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

Location	Qd,sh	Daily drawoff	170 l			Daily drawoff	200 l			Daily d	250 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	-	9492	4194	-	44	11164	4447	-	40	13939	4604	-	33
WürzburgDE	-	9114	4352	-	48	10691	4667	-	44	13371	4888	-	37
Davos CH	-	10281	6055	-	59	12110	6370	-	53	15137	6528	-	43
Athens GR	-	7064	5424	-	77	8326	5992	-	72	10407	6591	-	63

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
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Comments of test lab

No comments

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

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Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS STEE20	
Collector name	ATLAS CA200	No. Collectors	1	Storage name	T20

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

Location	Qd,sh	Daily drawoff		170 l		Daily drawoff		200 l		Daily d		250 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	-	9492	3690	-	39	11164	3879	-	35	13939	4005	-	29
WürzburgDE	-	9114	3879	-	43	10691	4100	-	38	13371	4226	-	32
Davos CH	-	10281	5235	-	51	12110	5487	-	45	15137	5613	-	37
Athens GR	-	7064	5014	-	71	8326	5487	-	66	10407	5929	-	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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
Test method	ISO 9459-5 (DST)

Comments of test lab

No comments

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Version 4.5, 2017-10-24

Summary of	EN12976-2	test results	Certification No.	SKM 10043/2
Annex to Solar KEYMARK Certificate			Issued	2018-08-30

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Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration				ATLAS STL20	
Collector name	ATLAS CA200	No. Collectors	2	Storage name	T20

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

Location	Qd,sh	Daily drawoff	170	l			Daily drawoff	200	l		Daily d	250	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	-	9492	5267	-	55		11164	5771	-	52	13939	6307	-	45	
WürzburgDE	-	9114	5298	-	58		10691	5897	-	55	13371	6528	-	49	
Davos CH	-	10281	7852	-	76		12110	8578	-	71	15137	9209	-	61	
Athens GR	-	7064	6244	-	88		8326	7064	-	85	10407	8105	-	78	

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
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Comments of test lab

No comments

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Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	T12						T15						T16						T20						T30					
ATLAS CA160	1														2				2											
ATLAS CA200		1					1						1							1		2			2					
ATLAS CA230								1						1							1					2				

Name of system configuration			ATLAS ST30
Collector name	ATLAS CA200	No. Collectors	2
		Storage name	T30

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

Location	Qd,sh	Daily drawoff	250 l			Daily drawoff	300 l			Daily d	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	-	13939	6654	-	48	16746	7190	-	43	22327	7569	-	34
WürzburgDE	-	13371	6875	-	51	16052	7506	-	47	21413	7979	-	37
Davos CH	-	15137	9745	-	64	18165	10407	-	57	24220	10754	-	44
Athens GR	-	10407	8389	-	81	12488	9461	-	76	16651	10722	-	64

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	300	kPa	Max. operating press. - tank side	1,000 kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
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Comments of test lab

No comments

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Postal Code	32009	Schimatari Viotias	Tel. / Fax	+30	22620 59260

System family overview

For each storage and collector size, give number of collectors

Collector name	T12	T15	T16	T20	T30
ATLAS CA160	1		2	2	
ATLAS CA200	1	1	1	1 2	2
ATLAS CA230	1	1	1	1	2

Name of system configuration				ATLAS STL30	
Collector name	ATLAS CA230	No. Collectors	2	Storage name	T30

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

Location	Qd,sh	Daily drawoff 250 l				Daily drawoff 300 l				Daily d 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	-	13939	7222	-	52	16746	7916	-	47	22327	8483	-	38
WürzburgDE	-	13371	7379	-	55	16052	8168	-	51	21413	8925	-	42
Davos CH	-	15137	10659	-	70	18165	11605	-	64	24220	12173	-	50
Athens GR	-	10407	8830	-	85	12488	9997	-	80	16651	11605	-	70

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	300	kPa	Max. operating press. - tank side	1,000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6095 DE1, 6096 DE1, 6096 F1
Date of test report	23/7/2018, 18/7/2018, 1/8/2017
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 4.5, 2017-10-24