



# ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΣΥΜΜΟΡΦΩΣΗΣ

Αρ. Πιστοποιητικού SKM 10043/2

Η DQS Hellas χορηγεί το παρόν Πιστοποιητικό στην επιχείρηση :

**SONNE AKTION ΕΠΕ**

Χαλκιδικής 39, 14451 Μεταμόρφωση

για το προϊόν:

**Οικογένεια ηλιακών συστημάτων:**

**ATLAS ST12, ATLAS STL12, ATLAS ST16, ATLAS STE16, ATLAS STL16,  
ATLAS ST20, ATLAS STE20, ATLAS STEE20, ATLAS STL20, ATLAS ST30,  
ATLAS STL30**

το οποίο παράγεται σύμφωνα με τα τυποποιητικά έγγραφα :

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

στην ακόλουθη θέση :

**68ο χλμ. Ε.Ο. Αθηνών – Λαμίας  
32009 Σχηματάρι Βοιωτίας**



Το παρόν Πιστοποιητικό χορηγείται σύμφωνα με:

- το Γενικό Κανονισμό Πιστοποίησης Προϊόντων της DQS Hellas,
- τον Ειδικό Κανονισμό Πιστοποίησης ΕΚΠΠ.001 «Ειδικός Κανονισμός Πιστοποίησης Ηλιακών Συλλεκτών, και Οικιακών Ηλιακών Συστημάτων Θέρμανσης Νερού»

και διέπεται από τους όρους της αντίστοιχης σύμβασης μεταξύ της DQS Hellas και της επιχείρησης

Ημερομηνία Έκδοσης: **2021-09-10**

Ημερομηνία Λήξεως: **2024-09-10**

**Παναγιώτης Γιαννούτσος**  
Διευθυντής Πιστοποίησης

**Dr. Εμμανουήλ Δεληγιαννάκης**  
Γενικός Διευθυντής



Πιστοποίηση Προϊόντων  
Αρ. Διαπίστευσης: 735

Διαπιστευμένος Φορέας: Καλαβρύτων 4, 14564 Κηφισιά – Αθήνα

ΓΚΠΠ-08 – 15/12/2014



# CERTIFICATE OF CONFORMITY

Certificate No SKM 10043/2

*DQS Hellas grants the present certificate to the enterprise:*

**SONNE AKTION LTD**  
39 Chalkidikis, 14451 Metamorfoosi

*for the product:*

**Solar systems family:**  
**ATLAS ST12, ATLAS STL12, 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 EKIII.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:* **2021-09-10**

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

**Panagiotis Giannoutsos**  
*Director of Certification*

**Dr. Emmanuel Deliyannakis**  
*Managing Director*



Products Certification  
Accreditation No: 735

Accredited Body: 4, Kalavriton Street, 14564 Kifissia - Athens, Greece

ΓΚIII-08 – 15/12/2014





# ΠΙΣΤΟΠΟΙΗΤΙΚΟ ΑΔΕΙΑ ΧΡΗΣΕΩΣ KEYMARK

Αρ. Πιστοποιητικού SKM 10043/2

Η DQS Hellas χορηγεί την παρούσα άδεια στην επιχείρηση :

**SONNE AKTION ΕΠΕ**  
Χαλκιδικής 39, 14451 Μεταμόρφωση

για το προϊόν:

**Οικογένεια ηλιακών συστημάτων:**  
**ATLAS ST12, ATLAS STL12, ATLAS ST16, ATLAS STE16, ATLAS STL16,**  
**ATLAS ST20, ATLAS STE20, ATLAS STEE20, ATLAS STL20, ATLAS ST30,**  
**ATLAS STL30**

το οποίο παράγεται σύμφωνα με τα τυποποιητικά έγγραφα :

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

στην ακόλουθη θέση :

**68ο χλμ. Ε.Ο. Αθηνών – Λαμίας**  
**32009 Σχηματάρι**



Η παρούσα Άδεια χορηγείται σύμφωνα με:

- το Γενικό Κανονισμό Πιστοποίησης Προϊόντων της DQS Hellas,
- τον Ειδικό Κανονισμό Πιστοποίησης ΕΚΠΠ.001 «Ειδικός Κανονισμός Πιστοποίησης Ηλιακών Συλλεκτών, και Οικιακών Ηλιακών Συστημάτων Θέρμανσης Νερού»,
- τον Ειδικό Κανονισμό της CEN Σχήματος SOLAR KEYMARK για ηλιακά θερμικά προϊόντα,

και διέπεται από τους όρους της αντίστοιχης σύμβασης μεταξύ της DQS Hellas και της επιχείρησης.

Ημερομηνία Έκδοσης: **2021-09-10**

Ημερομηνία Λήξεως: **2024-09-10**

**Παναγιώτης Γιαννούτσος**  
Διευθυντής Πιστοποίησης

Κοινοποιημένος Φορέας: Καλαβρύτων 4, 14564 Κηφισιά – Αθήνα

**Dr. Εμμανουήλ Δεληγιαννάκης**  
Γενικός Διευθυντής

EEK.001-07 – 10/11/2011



# 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 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 EKIII.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:* **2021-09-10**

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

**Panagiotis Giannoutsos**  
*Director of Product Certification*

**Dr. Emmanuel Deliyannakis**  
*Managing Director*









<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
For each storage and collector size, give number of collectors													
<b>Collector name</b>	T12	T15	T16	T20	T30								
ATLAS CA160	1		2	2									
ATLAS CA200	1	1	1	1	2								
ATLAS CA230		1	1	1	2								
<b>Name of system configuration</b>					ATLAS ST12								
<b>Collector name</b>	ATLAS CA160	<b>No. Collectors</b>	1	<b>Storage name</b>	T12								
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b>	<b>Daily drawoff 80 l</b>				<b>Daily drawoff 110 l</b>				<b>Daily drawoff 140 l</b>			
	MI/y	Q <sub>d,hw</sub> MI/y	Q <sub>L</sub> MI/y	Q <sub>par</sub> MI/y	f <sub>sol</sub> %	Q <sub>d,hw</sub> MI/y	Q <sub>L</sub> MI/y	Q <sub>par</sub> MI/y	f <sub>sol</sub> %	Q <sub>d,hw</sub> MI/y	Q <sub>L</sub> MI/y	Q <sub>par</sub> MI/y	f <sub>sol</sub> %
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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MI/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MI/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MI/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MI/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
		1,157	1,230	1,684	1,736								
	T <sub>a,ave</sub>	7.5	9.0	3.2	18.5								
	T <sub>c,ave</sub>	8.5	10.0	5.4	17.8								
	± ΔT <sub>c</sub>	6.4	3.0	0.8	7.4								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr. Vasellis Beleniotis Tel: +210 550.8615 - Fax: +210 6344.569 153 10 Ag. Paraskevi - Attika - 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



<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					<b>ATLAS STL12</b>								
<b>Collector name</b>	<b>ATLAS CA200</b>		<b>No. Collectors</b>	<b>1</b>		<b>Storage name</b>	<b>T12</b>						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Qd,sh</b> MJ/y	<b>Daily drawoff 80</b>				<b>Daily drawoff 110</b>				<b>Daily drawoff 140</b>			
		<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %
Stockholm SE	-	4478	2498	-	56	6150	3043	-	50	7821	3343	-	43
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
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 <sub>sol</sub> =Q <sub>l</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	7.5	9.0	3.2	18.5								
	T <sub>c,ave</sub>	8.5	10.0	5.4	17.8								
	±ΔT <sub>c</sub>	6.4	3.0	0.8	7.4								
	G	kWh/m <sup>2</sup>	Annual irradiation South, 45°										
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300 kPa		<b>Max. operating press. - tank side</b>		1,000 kPa							
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.H "DEMOKRITOS" SOLAR ENERGY LABORATORY Head, Dr Vassilis Bellos Tel: +210 8503816 - Fax: +210 8543644 158 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





<b>Summary of</b>		<b>EN12976-2</b>		<b>test results</b>		<b>Certification No.</b>		<b>SKM 10043/2</b>					
<b>Annex to Solar KEYMARK Certificate</b>						<b>Issued</b>		<b>2018-08-30</b>					
<b>Company</b>		SONNE AKTION LTD				<b>Country</b>		Greece					
<b>Brand (optional)</b>		ATLAS				<b>Website</b>		www.sonne.gr					
<b>Street</b>		68 Km N.R. Athens - Lamia				<b>E-mail</b>		info@sonne.gr					
<b>Postal Code</b>		32009		Schimatari Viotias		<b>Tel. / Fax</b>		+30 22620 59260					
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	<b>T12</b>		<b>T15</b>		<b>T16</b>		<b>T20</b>		<b>T30</b>				
ATLAS CA160	1					2		2					
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>													
<b>Collector name</b>						ATLAS CA230		<b>No. Collectors</b>		1			
<b>Storage name</b>						ATLAS ST15							
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Qd,sh</b> MJ/y	<b>Daily drawoff 110</b>				<b>Daily drawoff 140</b>				<b>Daily drawoff 170</b>			
		<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %
Stockholm SE	-	6150	3280	-	54	7821	3784	-	48	9492	4068	-	43
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
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											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	Ta,ave	1,157	1,230	1,684	1,736								
	Tc,ave	7.5	9.0	3.2	18.5								
	± ΔTc	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	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).											
<b>Max. operating press. - collector side</b>		300		kPa		<b>Max. operating press. - tank side</b>		1,000		kPa			
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>										<p>N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotakis Tel: +210 5503615 Fax: +210 6544522 150 10 Ag. Paraskevi - Attiki - Greece</p>			
No comments													

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





<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					<b>ATLAS STE15</b>								
<b>Collector name</b>	<b>ATLAS CA200</b>		<b>No. Collectors</b>	<b>1</b>		<b>Storage name</b>	<b>T15</b>						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b> MJ/y	<b>Daily drawoff 110</b>				<b>Daily drawoff 140</b>				<b>Daily drawoff 170</b>			
		<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %
Stockholm SE	-	6150	3031	-	49	7821	3406	-	44	9492	3627	-	38
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MJ/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MJ/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.R. "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +210 6506815 Fax: +210 6544545 153 10 Ag. Barabrevi - 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



<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					ATLAS ST16								
<b>Collector name</b>	ATLAS CA230		<b>No. Collectors</b>	1		<b>Storage name</b>	T16						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	Q <sub>d,sh</sub> MJ/y	Daily drawoff 110				Daily drawoff 140				Daily drawoff 170			
		Q <sub>d,hw</sub> MJ/y	Q <sub>L</sub> MJ/y	Q <sub>par</sub> MJ/y	f <sub>sol</sub> %	Q <sub>d,hw</sub> MJ/y	Q <sub>L</sub> MJ/y	Q <sub>par</sub> MJ/y	f <sub>sol</sub> %	Q <sub>d,hw</sub> MJ/y	Q <sub>L</sub> MJ/y	Q <sub>par</sub> MJ/y	f <sub>sol</sub> %
Stockholm SE	-	6150	3311	-	54	7821	3784	-	49	9492	4131	-	44
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MJ/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MJ/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr. Vassilis Bellos Tel: +210 6603015 - Fax: +210 6544997 153 IG 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





<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					<b>ATLAS STE16</b>								
<b>Collector name</b>	<b>ATLAS CA200</b>		<b>No. Collectors</b>	<b>1</b>		<b>Storage name</b>	<b>T16</b>						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b> MJ/y	<b>Daily drawoff 110 l</b>				<b>Daily drawoff 140 l</b>				<b>Daily drawoff 170 l</b>			
		<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %
Stockholm SE	-	6150	3027	-	49	7821	3437	-	44	9492	3658	-	39
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	<b>Not relevant for solar domestic hot water system</b>											
Q <sub>d</sub>	MJ/y	<b>Annual heat demand for domestic hot water</b>											
Q <sub>L</sub>	MJ/y	<b>Annual heat energy delivered by the solar system</b>											
Q <sub>par</sub>	MJ/y	<b>Annual parasitic energy: (electricity for pumps/controllers)</b>											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	<b>Solar fraction</b>											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	<b>Annual irradiation South, 45°</b>											
T <sub>a,ave</sub>	°C	<b>Annual average outdoor air temperature</b>											
T <sub>c,ave</sub>	°C	<b>Annual average mains cold water temp.</b>											
ΔT <sub>c</sub>	K	<b>Seasonal variation of T<sub>c</sub></b>											
T <sub>h</sub>	45 °C	<b>Desired hot water temperature (mixing valve temperature).</b>											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Deligiannis Tel: +210 6503616 - Fax: +210 6544500 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



<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1					2		2					
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					ATLAS STL16								
<b>Collector name</b>	ATLAS CA160		<b>No. Collectors</b>	2		<b>Storage name</b>	T16						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b> MJ/y	<b>Daily drawoff 110</b>				<b>Daily drawoff 140</b>				<b>Daily drawoff 170</b>			
		<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %
Stockholm SE	-	6150	3658	-	60	7821	4320	-	55	9492	4825	-	51
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MJ/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MJ/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>											N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +210 6500913 - Fax: +210 6500914 153 10 Ag. Paraskevi - Athens - Greece		
No comments													

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





<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					ATLAS ST20								
<b>Collector name</b>	ATLAS CA160		<b>No. Collectors</b>	2		<b>Storage name</b>	T20						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b> MJ/y	<b>Daily drawoff 170</b>				<b>Daily drawoff 200</b>				<b>Daily drawoff 250</b>			
		<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %
Stockholm SE	-	9492	4920	-	52	11164	5330	-	48	13939	5708	-	41
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MJ/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MJ/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>											N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Belesiotis Tel: +210 6500615 - Fax: +210 6544694 153 10 Ag. Paraskevi - Attiki - Greece		
No comments													

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



<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					<b>ATLAS STE20</b>								
<b>Collector name</b>	<b>ATLAS CA230</b>		<b>No. Collectors</b>		<b>1</b>		<b>Storage name</b>		<b>T20</b>				
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Qd,sh</b> MJ/y	<b>Daily drawoff 170 l</b>				<b>Daily drawoff 200 l</b>				<b>Daily drawoff 250 l</b>			
		<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %
Stockholm SE	-	9492	4194	-	44	11164	4447	-	40	13939	4604	-	33
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
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											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	Ta,ave	1,157	1,230	1,684	1,736								
	Tc,ave	7.5	9.0	3.2	18.5								
	± ΔTc	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	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).											
<b>Max. operating press. - collector side</b>		300 kPa		<b>Max. operating press. - tank side</b>		1,000 kPa							
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr. Vassilios Belesiotis Tel: +210 6503915 - 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





<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2		2			
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					ATLAS STEE20								
<b>Collector name</b>	ATLAS CA200		<b>No. Collectors</b>	1		<b>Storage name</b>	T20						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b> MJ/y	<b>Daily drawoff 170 l</b>				<b>Daily drawoff 200 l</b>				<b>Daily drawoff 250 l</b>			
		<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %
Stockholm SE	-	9492	3690	-	39	11164	3879	-	35	13939	4005	-	29
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MJ/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MJ/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
		6.4	3.0	0.8	7.4								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>											N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr. Vasilis Bellos Tel: +30 690815 - Fax: +30 694409 163 70 Ag. Paraskevi - Attiki - Greece		
No comments													

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



<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2	2				
ATLAS CA230			1		1		1		2				
<b>Name of system configuration</b>					<b>ATLAS STL20</b>								
<b>Collector name</b>	<b>ATLAS CA200</b>		<b>No. Collectors</b>	<b>2</b>		<b>Storage name</b>	<b>T20</b>						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Qd,sh</b> MJ/y	<b>Daily drawoff 170 l</b>				<b>Daily drawoff 200 l</b>				<b>Daily drawoff 250 l</b>			
		<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %	<b>Qd,hw</b> MJ/y	<b>QL</b> MJ/y	<b>Qpar</b> MJ/y	<b>fsol</b> %
Stockholm SE	-	9492	5267	-	55	11164	5771	-	52	13939	6307	-	45
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
Qd,sh	MJ/y	<b>Not relevant for solar domestic hot water system</b>											
Qd	MJ/y	<b>Annual heat demand for domestic hot water</b>											
QL	MJ/y	<b>Annual heat energy delivered by the solar system</b>											
Qpar	MJ/y	<b>Annual parasitic energy: (electricity for pumps/controllers)</b>											
$f_{sol} = Q_L / Q_d$	-	<b>Solar fraction</b>											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	<b>Annual irradiation South, 45°</b>											
T <sub>a,ave</sub>	°C	<b>Annual average outdoor air temperature</b>											
T <sub>c,ave</sub>	°C	<b>Annual average mains cold water temp.</b>											
ΔT <sub>c</sub>	K	<b>Seasonal variation of T<sub>c</sub></b>											
T <sub>h</sub>	45 °C	<b>Desired hot water temperature (mixing valve temperature).</b>											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS" - SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>													
No comments													
N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vasilis Balassietis Tel: +210 6580015 - Fax: +210 6580000 150 10 Ag. Paraskevi - Attika - 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





<b>Summary of</b>	<b>EN12976-2</b>	<b>test results</b>	<b>Certification No.</b>	<b>SKM 10043/2</b>									
<b>Annex to Solar KEYMARK Certificate</b>			<b>Issued</b>	<b>2018-08-30</b>									
<b>Company</b>	SONNE AKTION LTD		<b>Country</b>	Greece									
<b>Brand (optional)</b>	ATLAS		<b>Website</b>	www.sonne.gr									
<b>Street</b>	68 Km N.R. Athens - Lamia		<b>E-mail</b>	info@sonne.gr									
<b>Postal Code</b>	32009	Schimatari Viotias	<b>Tel. / Fax</b>	+30 22620 59260									
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2	2				
ATLAS CA230			1		1		1			2			
<b>Name of system configuration</b>					ATLAS ST30								
<b>Collector name</b>	ATLAS CA200		<b>No. Collectors</b>	2		<b>Storage name</b>	T30						
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Q<sub>d,sh</sub></b> MJ/y	<b>Daily drawoff 250 l</b>				<b>Daily drawoff 300 l</b>				<b>Daily drawoff 400 l</b>			
		<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %	<b>Q<sub>d,hw</sub></b> MJ/y	<b>Q<sub>L</sub></b> MJ/y	<b>Q<sub>par</sub></b> MJ/y	<b>f<sub>sol</sub></b> %
Stockholm SE	-	13939	6654	-	48	16746	7190	-	43	22327	7569	-	34
Würzburg DE	-	13971	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
<b>Perf. indicators for the table above</b>													
Q <sub>d,sh</sub>	MJ/y	Not relevant for solar domestic hot water system											
Q <sub>d</sub>	MJ/y	Annual heat demand for domestic hot water											
Q <sub>L</sub>	MJ/y	Annual heat energy delivered by the solar system											
Q <sub>par</sub>	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)											
f <sub>sol</sub> =Q <sub>L</sub> /Q <sub>d</sub>	-	Solar fraction											
<b>Ref. conditions</b>	G	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
	T <sub>a,ave</sub>	1,157	1,230	1,684	1,736								
	T <sub>c,ave</sub>	7.5	9.0	3.2	18.5								
	± ΔT <sub>c</sub>	8.5	10.0	5.4	17.8								
G	kWh/m <sup>2</sup>	Annual irradiation South, 45°											
T <sub>a,ave</sub>	°C	Annual average outdoor air temperature											
T <sub>c,ave</sub>	°C	Annual average mains cold water temp.											
ΔT <sub>c</sub>	K	Seasonal variation of T <sub>c</sub>											
T <sub>h</sub>	45 °C	Desired hot water temperature (mixing valve temperature).											
<b>Max. operating press. - collector side</b>		300	kPa	<b>Max. operating press. - tank side</b>		1,000	kPa						
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>											N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilis Bellesiotis Tel: +910 6503015 - Fax: +910 6514500 150 10 Ag. Paraskevi - Attiki - Greece		
No comments													

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



<b>Summary of</b>		<b>EN12976-2 test results</b>		<b>Certification No.</b>		<b>SKM 10043/2</b>							
<b>Annex to Solar KEYMARK Certificate</b>				<b>Issued</b>		<b>2018-08-30</b>							
<b>Company</b>	SONNE AKTION LTD			<b>Country</b>	Greece								
<b>Brand (optional)</b>	ATLAS			<b>Website</b>	www.sonne.gr								
<b>Street</b>	68 Km N.R. Athens - Lamia			<b>E-mail</b>	info@sonne.gr								
<b>Postal Code</b>	32009	Schimatari Viotias		<b>Tel. / Fax</b>	+30	22620 59260							
<b>System family overview</b>													
<b>For each storage and collector size, give number of collectors</b>													
<b>Collector name</b>	T12		T15		T16		T20		T30				
ATLAS CA160	1				2		2						
ATLAS CA200	1		1		1		1	2	2				
ATLAS CA230			1		1		1		2				
<b>Name of system configuration</b>													
ATLAS STL30													
<b>Collector name</b>	ATLAS CA230		<b>No. Collectors</b>		2		<b>Storage name</b>		T30				
<b>Calculated annual results for "solar-only / preheat system"</b>													
<b>Location</b>	<b>Qd,sh</b>	<b>Daily drawoff 250</b>				<b>Daily drawoff 300</b>				<b>Daily drawoff 400</b>			
		<b>Qd,hw</b>	<b>QL</b>	<b>Qpar</b>	<b>fsol</b>	<b>Qd,hw</b>	<b>QL</b>	<b>Qpar</b>	<b>fsol</b>	<b>Qd,hw</b>	<b>QL</b>	<b>Qpar</b>	<b>fsol</b>
	<b>MJ/y</b>	<b>MJ/y</b>	<b>MJ/y</b>	<b>MJ/y</b>	<b>%</b>	<b>MJ/y</b>	<b>MJ/y</b>	<b>MJ/y</b>	<b>%</b>	<b>MJ/y</b>	<b>MJ/y</b>	<b>MJ/y</b>	<b>%</b>
Stockholm SE	-	13339	7222	-	52	16746	7916	-	47	22327	8483	-	38
Würzburg DE	-	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
<b>Perf. indicators for the table above</b>													
<b>Qd,sh</b>	<b>MJ/y</b>	<b>Not relevant for solar domestic hot water system</b>											
<b>Qd</b>	<b>MJ/y</b>	<b>Annual heat demand for domestic hot water</b>											
<b>QL</b>	<b>MJ/y</b>	<b>Annual heat energy delivered by the solar system</b>											
<b>Qpar</b>	<b>MJ/y</b>	<b>Annual parasitic energy: (electricity for pumps/controllers)</b>											
<b>f<sub>sol</sub>=QL/Q<sub>d</sub></b>	-	<b>Solar fraction</b>											
<b>Ref. conditions</b>	<b>G</b>	Stockholm SE	Würzburg DE	Davos CH	Athens GR								
		1,157	1,230	1,684	1,736								
	<b>T<sub>a,ave</sub></b>	7.5	9.0	3.2	18.5								
	<b>T<sub>c,ave</sub></b>	8.5	10.0	5.4	17.8								
	<b>± ΔT<sub>c</sub></b>	6.4	3.0	0.8	7.4								
<b>G</b>	<b>kWh/m<sup>2</sup></b>	<b>Annual irradiation South, 45°</b>											
<b>T<sub>a,ave</sub></b>	<b>°C</b>	<b>Annual average outdoor air temperature</b>											
<b>T<sub>c,ave</sub></b>	<b>°C</b>	<b>Annual average mains cold water temp.</b>											
<b>ΔT<sub>c</sub></b>	<b>K</b>	<b>Seasonal variation of T<sub>c</sub></b>											
<b>Th</b>	<b>45 °C</b>	<b>Desired hot water temperature (mixing valve temperature).</b>											
<b>Max. operating press. - collector side</b>		300		kPa		<b>Max. operating press. - tank side</b>		1,000		kPa			
<b>Testing Laboratory</b>		NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB											
<b>Website</b>		www.solar.demokritos.gr											
<b>Test report id. number</b>		6095 DE1, 6096 DE1, 6096 F1											
<b>Date of test report</b>		23/7/2018, 18/7/2018, 1/8/2017											
<b>Test method</b>		ISO 9459-5 (DST)											
<b>Comments of test lab</b>		No comments											
		N.C.S.R "DEMOKRITOS" SOLAR ENERGY LABORATORY Head: Dr Vassilios Bellos Tel: +210 8508616 - Fax: +210 8541054 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