Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)			Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

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	VENMAN S.A.			Company	VENMAN S.A.					
Keymark lic.no. if available	*SKM 10109.1*			*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
H81MP 2.0	1.90	1970	965	150L	136	1250	500			
H81MP 2.5	2.40	1970	1220	200L	190	1250	580			
				250L	230	1550	580			
				300L	276	1785	580			

Solar loop controller				Solar loop fluid		
Keymark lic.no. if available	-			Recommended/required	Recommended	
Company	-			Company	-	
Name	-			Name	-	
Solar loop pump - power range	W	to	W	Freezing point	-32	°C

System family overview

Collector name	Number of collectors in each configuration for each store																									
	Store name																									
	150L						200L						250L						300L							
H81MP 2.0	1						1	2					1	2	3				1	2	3					
H81MP 2.5	1						1	2					1	2					1	2	3					

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04

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

Summary of	EN12976-2	test results	Certification No.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration					
Collector name	H81MP 2.0	No. Collectors	1	Storage name	150L

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	-	6150	3154	0	51	7821	3658	0	47	9492	3942	0	42
WürzburgDE	-	5897	3185	0	54	7506	3753	0	50	9114	4131	0	45
Davos CH	-	6654	4636	0	70	8483	5330	0	63	10281	5676	0	55
Athens GR	-	4573	3847	0	84	5834	4636	0	80	7064	5235	0	74

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab
Extrapolated

N.C.S.R. "DEMOKRITOS"
SOLAR ENERGY LABORATORY
Tel: +210 6503815 - Fax: +210 6544592
P.O. BOX 60037, 15310 Ag. Paraskevi, Greece

Summary of	EN12976-2	test results	Certification No.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																								
	150L						200L						250L						300L							
H81MP 2.0	1						1	2					1	2	3				1	2	3					
H81MP 2.5	1						1	2					1	2					1	2	3					

Name of system configuration							
					VMP.151.25.10		
Collector name	H81MP 2.5	No. Collectors	1	Storage name	150L		

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	-	6150	3469	0	56	7821	4068	0	52	9492	4478	0	47
WürzburgDE	-	5897	3437	0	59	7506	4131	0	55	9114	4604	0	51
Davos CH	-	6654	5140	0	77	8483	6023	0	71	10281	6591	0	64
Athens GR	-	4573	4068	0	89	5834	4951	0	85	7064	5676	0	80

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	150L						200L						250L						300L											
H81MP 2.0	1						1	2					1	2	3				1	2	3									
H81MP 2.5	1						1	2					1	2					1	2	3									

Name of system configuration					VMP.201.20.10		
Collector name	H81MP 2.0	No. Collectors	1		Storage name	200L	

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

Location	Qd,sh	Daily drawoff	170 l			Daily drawoff	200 l			Daily drawoff	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	4005	0	42	11164	4289	0	38	13939	4478	0	32
WürzburgDE	-	9114	4163	0	46	10691	4510	0	42	13371	4762	0	36
Davos CH	-	10281	5740	0	56	12110	6086	0	50	15137	6307	0	42
Athens GR	-	7064	5298	0	75	8326	5866	0	70	10407	6465	0	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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration				VMP.202.20.10	
Collector name	H81MP 2.0	No. Collectors	2	Storage name	200L

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

Location	Qd,sh	Daily drawoff	170 l			Daily drawoff	200 l			Daily drawoff	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	5424	0	57	11164	6055	0	54	13939	6749	0	48
WürzburgDE	-	9114	5424	0	60	10691	6118	0	57	13371	6938	0	52
Davos CH	-	10281	8105	0	79	12110	9019	0	74	15137	9997	0	66
Athens GR	-	7064	6339	0	90	8326	7222	0	87	10407	8452	0	81

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration					VMP.201.25.10		
Collector name	H81MP 2.5	No. Collectors	1		Storage name	200L	

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

Location	Qd,sh	Daily drawoff	170	l			Daily drawoff	200	l			Daily drawoff	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	4573	0	48		11164	4983	0	45		13939	5298	0	38	
WürzburgDE	-	9114	4699	0	52		10691	5172	0	48		13371	5613	0	42	
Davos CH	-	10281	6686	0	65		12110	7222	0	60		15137	7600	0	50	
Athens GR	-	7064	5740	0	81		8326	6433	0	78		10407	7285	0	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	250	kPa	Max. operating press. - tank side	1000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration					VMP.202.25.10		
Collector name	H81MP 2.5	No. Collectors	2		Storage name	200L	

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

Location	Qd,sh	Daily drawoff	170	l			Daily drawoff	200	l			Daily drawoff	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	5803	0	61		11164	6528	0	58		13939	7411	0	53	
WürzburgDE	-	9114	5740	0	63		10691	6496	0	61		13371	7506	0	56	
Davos CH	-	10281	8641	0	84		12110	9745	0	80		15137	11038	0	73	
Athens GR	-	7064	6559	0	93		8326	7506	0	90		10407	8925	0	86	

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																								
	150L						200L						250L						300L							
H81MP 2.0	1						1	2					1	2	3				1	2	3					
H81MP 2.5	1						1	2					1	2					1	2	3					

Name of system configuration					VMP.251.20.10		
Collector name	H81MP 2.0	No. Collectors	1		Storage name	250L	

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

Location	Qd,sh	Daily drawoff	200	l			Daily drawoff	250	l			Daily drawoff	300	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	-	11164	4226	0	38		13939	4573	0	33		16746	4699	0	28	
WürzburgDE	-	10691	4478	0	42		13371	4857	0	36		16052	5014	0	31	
Davos CH	-	12110	5992	0	49		15137	6433	0	43		18165	6559	0	36	
Athens GR	-	8326	5834	0	70		10407	6591	0	63		12488	7033	0	56	

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																											
	150L						200L						250L						300L											
H81MP 2.0	1						1	2					1	2	3				1	2	3									
H81MP 2.5	1						1	2					1	2					1	2	3									

Name of system configuration					VMP.252.20.10		
Collector name	H81MP 2.0	No. Collectors	2		Storage name	250L	

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

Location	Qd,sh	Daily drawoff	200	l			Daily drawoff	250	l			Daily drawoff	300	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	-	11164	6150	0	55		13939	7001	0	50		16746	7506	0	45	
WürzburgDE	-	10691	6213	0	58		13371	7190	0	54		16052	7821	0	49	
Davos CH	-	12110	9177	0	76		15137	10375	0	69		18165	10975	0	60	
Athens GR	-	8326	7316	0	88		10407	8641	0	83		12488	9682	0	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	250	kPa	Max. operating press. - tank side	1000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
TESTED	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 %

Summary of	EN12976-2	test results	Certification No.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration				VMP.251.25.10	
Collector name	H81MP 2.5	No. Collectors	1	Storage name	250L

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

Location	Qd,sh	Daily drawoff 200 l				Daily drawoff 250 l				Daily drawoff 300 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	-	11164	4983	0	45	13939	5456	0	39	16746	5676	0	34
WürzburgDE	-	10691	5140	0	48	13371	5771	0	43	16052	6023	0	38
Davos CH	-	12110	7159	0	59	15137	7789	0	52	18165	8010	0	44
Athens GR	-	8326	6433	0	77	10407	7411	0	71	12488	8073	0	65

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration					VMP.252.25.10		
Collector name	H81MP 2.5	No. Collectors	2	Storage name	250L		

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

Location	Qd,sh	Daily drawoff	200 l			Daily drawoff	250 l			Daily drawoff	300 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	-	11164	6591	0	59	13939	7632	0	55	16746	8389	0	50
WürzburgDE	-	10691	6528	0	61	13371	7695	0	58	16052	8578	0	53
Davos CH	-	12110	9808	0	81	15137	11384	0	75	18165	12425	0	68
Athens GR	-	8326	7569	0	91	10407	9082	0	87	12488	10344	0	83

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																													
	150L						200L						250L						300L												
H81MP 2.0	1						1	2					1	2	3				1	2	3										
H81MP 2.5	1						1	2					1	2					1	2	3										

Name of system configuration					VMP.253.20.10		
Collector name	H81MP 2.0	No. Collectors	3	Storage name	250L		

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

Location	Qd,sh	Daily drawoff	200	l			Daily drawoff	250	l			Daily drawoff	300	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	-	11164	6843	0	61		13939	8042	0	58		16746	8893	0	53	
WürzburgDE	-	10691	6780	0	63		13371	8042	0	60		16052	9019	0	56	
Davos CH	-	12110	10218	0	84		15137	12015	0	79		18165	13245	0	73	
Athens GR	-	8326	7726	0	93		10407	9303	0	90		12488	10691	0	86	

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration				VMP.301.20.10	
Collector name	H81MP 2.0	No. Collectors	1	Storage name	300L

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	-	13939	4604	0	33	16746	4825	0	29	22327	5014	0	22
WürzburgDE	-	13371	4857	0	36	16052	5140	0	32	21413	5298	0	25
Davos CH	-	15137	6402	0	42	18165	6717	0	37	24220	6906	0	29
Athens GR	-	10407	6591	0	63	12488	7190	0	58	16651	7569	0	45

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																													
	150L						200L						250L						300L												
H81MP 2.0	1						1	2					1	2	3				1	2	3										
H81MP 2.5	1						1	2					1	2					1	2	3										

Name of system configuration				VMP.302.20.10			
Collector name	H81MP 2.0	No. Collectors	2	Storage name	300L		

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	-	13939	7096	0	51		16746	7821	0	47		22327	8452	0	38	
WürzburgDE	-	13371	7222	0	54		16052	8073	0	50		21413	8893	0	42	
Davos CH	-	15137	10470	0	69		18165	11448	0	63		24220	12110	0	50	
Athens GR	-	10407	8704	0	84		12488	9934	0	80		16651	11574	0	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	250	kPa	Max. operating press. - tank side	1000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																													
	150L						200L						250L						300L												
H81MP 2.0	1						1	2					1	2	3				1	2	3										
H81MP 2.5	1						1	2					1	2					1	2	3										

Name of system configuration				VMP.301.25.10	
Collector name	H81MP 2.5	No. Collectors	1	Storage name	300L

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	-	13939	5519	0	40	16746	5866	0	35	22327	6086	0	27
WürzburgDE	-	13371	5771	0	43	16052	6213	0	39	21413	6433	0	30
Davos CH	-	15137	7821	0	52	18165	8262	0	46	24220	8483	0	35
Athens GR	-	10407	7474	0	72	12488	8262	0	66	16651	9082	0	55

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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 %

Summary of	EN12976-2	test results	Certification No.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																									
	150L						200L						250L						300L								
H81MP 2.0	1						1	2					1	2	3				1	2	3						
H81MP 2.5	1						1	2					1	2					1	2	3						

Name of system configuration				VMP.302.25.10	
Collector name	H81MP 2.5	No. Collectors	2	Storage name	300L

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	-	13939	7821	0	56		16746	8735	0	52		22327	9776	0	44	
WürzburgDE	-	13371	7821	0	59		16052	8862	0	55		21413	10155	0	48	
Davos CH	-	15137	11605	0	77		18165	12961	0	71		24220	14254	0	59	
Athens GR	-	10407	9209	0	88		12488	10596	0	85		16651	12709	0	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	250	kPa	Max. operating press. - tank side	1000	kPa

Testing Laboratory	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
Website	www.solar.demokritos.gr
Test report id. number	6110 DE2, 6113 DE2, 6113 F2
Date of test report	2020-11-04
Test method	ISO 9459-5 (DST)

Comments of test lab	
Extrapolated	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.	SKM 10109.4
Annex to Solar KEYMARK Certificate			Issued	2020-11-10

Company	VENMAN S.A.		Country	Greece	
Brand (optional)	0		Website	http://www.venman.gr	
Street	7th Km Old National Road Thessaloniki – Kilkis		E-mail	info@venman.gr	
Postal Code	57022	Thessaloniki	Tel. / Fax	+30	2310 784684

System family overview

Collector name	For each storage and collector size, give number of collectors																													
	150L						200L						250L						300L												
H81MP 2.0	1						1	2					1	2	3				1	2	**3**										
H81MP 2.5	1						1	2					1	2					1	2	3										

Name of system configuration				VMP.303.20.10	
Collector name	H81MP 2.0	No. Collectors	3	Storage name	300L

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	-	13939	8199	0	59		16746	9240	0	55		22327	10596	0	47	
WürzburgDE	-	13371	8168	0	61		16052	9303	0	58		21413	10880	0	51	
Davos CH	-	15137	12236	0	81		18165	13813	0	76		24220	15579	0	64	
Athens GR	-	10407	9429	0	91		12488	10943	0	88		16651	13340	0	80	

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	NCSR "DEMOKRITOS"- SOLAR & ENERGY SYSTEMS LAB
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Version 4.5, 2017-10-24

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H81MP 2.5	1						1	2					1	2					1	2	3										

Name of system configuration					VMP.303.25.10		
Collector name	H81MP 2.5	No. Collectors	3	Storage name	300L		

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	-	13939	8735	0	63	16746	9934	0	59	22327	11668	0	52
WürzburgDE	-	13371	8609	0	64	16052	9902	0	62	21413	11826	0	55
Davos CH	-	15137	12993	0	86	18165	14853	0	82	24220	17345	0	72
Athens GR	-	10407	9745	0	94	12488	11384	0	91	16651	14097	0	85

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			
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G	kWh/m²	Annual irradiation South, 45°
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Max. operating press. - collector side	250	kPa	Max. operating press. - tank side	1000	kPa

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