



Summary of	EN12976-2	SOLAR SYSTEM test results	Licence Number	011-7S1839 A						
Annex to Solar KEYMARK Certificate			Issued	2024-02-06						
Company	Solahart Industries Pty Ltd.		Country	Australia						
Brand (optional)	L-series		Website	www.solahart.com						
Street	55 Brodie Street		E-mail	roberd.tjjam@rheem.com.au						
Postal Code	2116	Rydalmere NSW	Tel. / Fax	+61	425 299 610					
System classification										
Application(s)	Hot water									
Solar loop, circulation principle	Thermosyphon									
Direct solar loop / heat exchanger	Direct									
Open, vented or closed solar loop	Open									
Drain back/down	Always filled (no drain)									
Store location	Outdoor									
Store orientation (of main axis)	Horizontal									
Type of auxiliary heating (internal back-up heat)	None									
If other auxiliary/internal back-up heating, please specify:										
Solar+supplementary OR Solar-only / Solar pre-heat	Solar only / Solar preheat									
Collector(s)			Heat store(s)							
Company	Solahart Industries Pty Ltd.		Company	Solahart Industries Pty Ltd.						
Keymark lic.no. if available	011-7S1790 F		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							
L collector	1.98	1940	1020	150L	150	510	1280	-	-	-
				180L	180	510	1490	-	-	-
				220L	220	510	1760	-	-	-
				300L	300	510	2310	-	-	-
								-	-	-
								-	-	-
Solar loop controller			Solar loop fluid							
Keymark lic.no. if available	-		Recommended/required	No recommend./requirements						
Company	-		Company	-						
Name	-		Name	-						
Solar loop pump - power range	- W	to - W	Freezing point	-	°C					
System family overview										
Collector name	Number of collectors in each configuration for each store									
	Store name									
	150L		180L		220L		300L			
L collector	1		1		1		2			
Testing Laboratory	TZS/IGTE									
Website	www.igte.uni-stuttgart.de									
Test report id. number	23SYS152									
Date of test report	2024-01-12									
Comments of test lab	This data sheet replaces the data sheet issued 03.04.2017 due to retest of the systems.									
					<p>Forschungs- und Testzentrum für Solaranlagen Institut für Thermodynamik und Wärmetechnik Universität Stuttgart Pfaffenwaldring 6, 70560 Stuttgart (Vaihingen)</p>					



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Parameters for systems extrapolation (Annex D)

Collector of measured system		Storage tank of measured system	
A_{ref} [m ²]	1.98	Volume [l]	150
η_0	0.683	A_{hx} [m ²]	0.75
a_1 [W/Km ²]	5.127	Piping	
a_2 [W/Km ²]	0.030		
IAM (50°)	0.880	$U_{loop,p}$	0.91

System parameters

Name of System Configuration	Tested/Extrapol	A_c^* [m ²]	u_c^* [W/Km ²]	U_s [W/K]	C_s [MJ/K]	S_c [-]	D_L [-]	f_{aux} [-]
151L	Tested	1.120	12.030	1.872	0.616	0.135	0.012	-
181L	Extrapol	1.158	11.291	2.133	0.740	0.135	0.012	-
221L	Extrapol	1.141	11.291	2.457	0.904	0.135	0.012	-
302L	Extrapol	2.366	10.909	3.128	1.233	0.135	0.012	-

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Comments of test lab	Stamp & signature of test lab
No comments	



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System family overview

Collector name	For each storage and collector size, give number of collectors			
	150L	180L	220L	300L
L collector	1	1	1	2

Name of system configuration	151L				
Collector name	L collector	No. Collectors	1	Storage name	150L

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

Location	Qd,sh MJ/y	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	%
Stockholm SE	0	6107	3054	0	50	7772	3466	0	45	9437	3331	0	35
WürzburgDE	0	5854	3138	0	54	7450	3621	0	49	9047	3546	0	39
Davos CH	0	6628	4580	0	69	8435	5145	0	61	10243	4743	0	46
Athens GR	0	4545	3795	0	84	5784	4488	0	78	7023	4691	0	67

Perf. indicators for the table above

Qd,sh	MJ/y	Not relevant for solar domestic hot water system
Qd	MJ/y	Annual heat demand for domestic hot water
QL	MJ/y	Annual heat energy delivered by the solar system
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
$f_{sol}=Q_L/Q_d$	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 736
	T _{a,ave}	7.5	9.0	3.2	18.5
	T _{c,ave}	8.5	10.0	5.4	17.8
	± ΔT _c	6.4	3.0	0.8	7.4

G	kWh/m ²	Annual irradiation South, 45°
T _{a,ave}	°C	Annual average outdoor air temperature
T _{c,ave}	°C	Annual average mains cold water temp.
ΔT _c	K	Seasonal variation of T _c
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	1 400 kPa	Max. operating press. - tank side	1 000 kPa
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Date of test report	2024-01-12
Test method	ISO 9459-5 (DST)

Comments of test lab	Stamp & signature of test lab
No comments	



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Postal Code	2116	Rydalmere NSW	Tel. / Fax	+61 425299610

System family overview

Collector name	For each storage and collector size, give number of collectors															
	150L				180L				220L				300L			
L collector	1				1				1				2			

Name of system configuration	181L																			
Collector name	L collector				No. Collectors				1				Storage name				180L			

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

Location	Qd,sh MJ/y	Daily drawoff 140 l				Daily drawoff 170 l				Daily drawoff 200 l			
		Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol	Qd,hw	QL	Qpar	fsol
		MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%	MJ/y	MJ/y	MJ/y	%
Stockholm SE	0	7772	3233	0	42	9437	3548	0	38	11103	3686	0	33
WürzburgDE	0	7450	3367	0	45	9047	3755	0	42	10643	3917	0	37
Davos CH	0	8435	4639	0	55	10243	5050	0	49	12050	5206	0	43
Athens GR	0	5784	4280	0	74	7023	4881	0	70	8263	5288	0	64

Perf. indicators for the table above

Qd,sh	MJ/y	Not relevant for solar domestic hot water system
Qd	MJ/y	Annual heat demand for domestic hot water
QL	MJ/y	Annual heat energy delivered by the solar system
Qpar	MJ/y	Annual parasitic energy: (electricity for pumps/controllers)
$f_{sol}=Q_L/Q_d$	-	Solar fraction

Ref. conditions		Stockholm SE	Würzburg DE	Davos CH	Athens GR
	G	1 157	1 230	1 684	1 736
	T _{a,ave}	7.5	9.0	3.2	18.5
	T _{c,ave}	8.5	10.0	5.4	17.8
	± ΔT _c	6.4	3.0	0.8	7.4

G	kWh/m ²	Annual irradiation South, 45°
T _{a,ave}	°C	Annual average outdoor air temperature
T _{c,ave}	°C	Annual average mains cold water temp.
ΔT _c	K	Seasonal variation of T _c
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	1 400 kPa	Max. operating press. - tank side	1 000 kPa
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Postal Code	2116	Rydalmere NSW	Tel. / Fax	+61	425299610

System family overview

Collector name	For each storage and collector size, give number of collectors														
	150L			180L			220L			300L					
L collector	1			1			1			2					

Name of system configuration	302L				
Collector name	L collector	No. Collectors	2	Storage name	300L

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

Location	Qd,sh MJ/y	Daily drawoff 200 l				Daily drawoff 250 l				Daily drawoff 300 l			
		Qd,hw		Qpar		Qd,hw		Qpar		Qd,hw		Qpar	
		MJ/y	QL	MJ/y	fsol	MJ/y	QL	MJ/y	fsol	MJ/y	QL	MJ/y	fsol
Stockholm SE	0	11103	5552	0	50	13878	6370	0	46	16654	6961	0	42
WürzburgDE	0	10643	5651	0	53	13304	6546	0	49	15965	7232	0	45
Davos CH	0	12050	8182	0	68	15063	9279	0	62	18076	10032	0	56
Athens GR	0	8263	6900	0	84	10328	8149	0	79	12394	9196	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
T _{a,ave}	°C	7.5	9.0	3.2	18.5
T _{c,ave}	°C	8.5	10.0	5.4	17.8
± ΔT _c		6.4	3.0	0.8	7.4

G	kWh/m ²	Annual irradiation South, 45°
T _{a,ave}	°C	Annual average outdoor air temperature
T _{c,ave}	°C	Annual average mains cold water temp.
ΔT _c	K	Seasonal variation of T _c
Th	45 °C	Desired hot water temperature (mixing valve temperature).

Max. operating press. - collector side	1 400 kPa	Max. operating press. - tank side	1 000 kPa
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Collector name	For each storage and collector size, give number of collectors																			
	150L				180L				220L				300L							
L collector	1				1				1				2							

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Name of system configuration				181L	
Collector name	L collector	No. Collectors	1	Storage name	180L

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Load profile	M	L	XL	XXL	
Annual heat demand (kWh)	1523	2799	4427	5626	
Auxiliary heat contribution	Q _{nonsol}				section 5.9.3.6, see note 1
Average climate (kWh)	190	596	1406	2091	Strasbourg
Cold climate (kWh)	451	964	1818	2511	Helsinki
Hot climate (kWh)	0	0	688	1337	Athens
Q _{aux} (kWh)	-	-	-	-	section 5.9.3.4, see note 1
Comply to the load profile (Yes/No)	-	-	-	-	section 5.10.6, see note 1
η _{wh_nonsol} (%)	-	-	-	-	section 5.9.3.5, see note 1
Q _{elec} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
Q _{fuel} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
V ₄₀ , measured (l)	-	-	-	-	section 5.10.7, see note 1

Auxiliary thermostat setting	-	°C	Effective power of auxiliary heater	-	kW
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Note 1: Clause of EN 12976-2:2017

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	150L				180L				220L				300L							
L collector	1				1				1				2							

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Name of system configuration				302L	
Collector name	L collector	No. Collectors	2	Storage name	300L

Annual performance parameters in the frame of the EU regulation CDR 811, 812 and 813 dated 2013

Load profile	M	L	XL	XXL	
Annual heat demand (kWh)	1523	2799	4427	5626	
Auxiliary heat contribution	Q _{nonsol}				section 5.9.3.6, see note 1
Average climate (kWh)	0	62	417	934	Strasbourg
Cold climate (kWh)	284	552	1091	1670	Helsinki
Hot climate (kWh)	0	0	0	0	Athens
Q _{aux} (kWh)	-	-	-	-	section 5.9.3.4, see note 1
Comply to the load profile (Yes/No)	-	-	-	-	section 5.10.6, see note 1
η _{wh_nonsol} (%)	-	-	-	-	section 5.9.3.5, see note 1
Q _{elec} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
Q _{fuel} (kWh)	-	-	-	-	section 5.9.3.5, see note 1
V ₄₀ , measured (l)	-	-	-	-	section 5.10.7, see note 1

Auxiliary thermostat setting	-	°C	Effective power of auxiliary heater	-	kW
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Note 1: Clause of EN 12976-2:2017

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