



Energy Labelling of factory made systems Deliverable D3.4 – Part 2: Annexes

CENER

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Table of contents

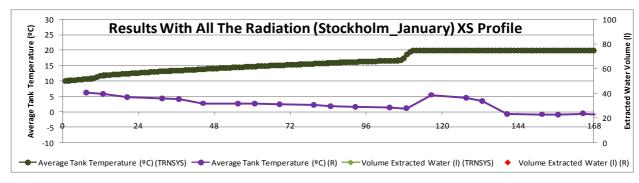
T	able of con	tents	2
1	ANNEX	1 - CSTG LTPP result validation: comparison R vs. TRNSY	'S. 3
	1.1 Sto	ckholm results	3
	1.1.1	January 1st week	3
	1.1.2	July 1st week	4
	1.2 Wü	rzburg results	5
	1.2.1	January 1st week	5
	1.2.2	July 1st week	6
	1.3 Dav	vos results	7
	1.3.1	January 1st week	7
	1.3.2	July 1st week	8
	1.4 Ath	ens results	9
	1.4.1	January 1st week	9
	1.4.2	July 1st week	10
	1.5 Sev	rille results	11
	1.5.1	January 1st week	11
	1.5.2	July 1st week	12
	1.6 Lisk	oon results	13
	1.6.1	January 1st week	13
	1.6.2	July 1st week	14
2	ANNEX	2 - Solahart 180 J	15
	2.1 Mai	nufacturer technical data:	15
	2.2 CS	TG test results	17

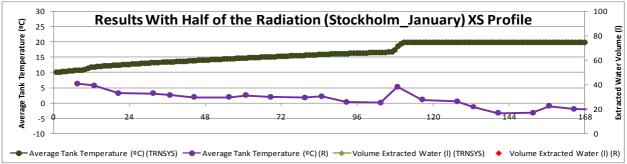


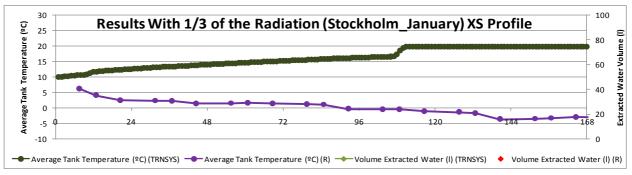
1 ANNEX 1 - CSTG LTPP result validation: comparison R vs. TRNSYS

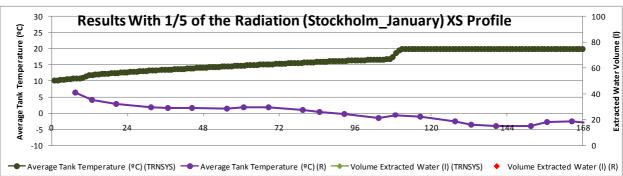
1.1 Stockholm results

1.1.1 January 1st week



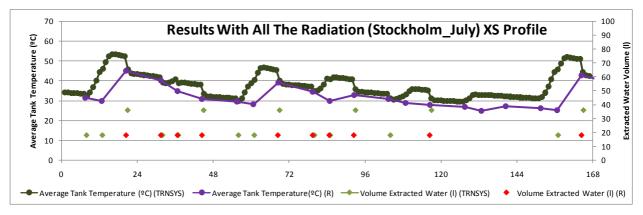


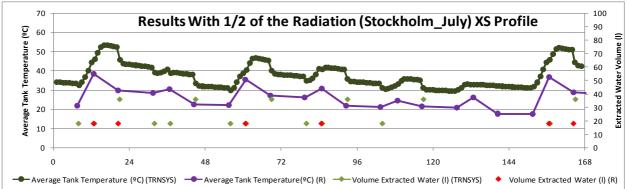


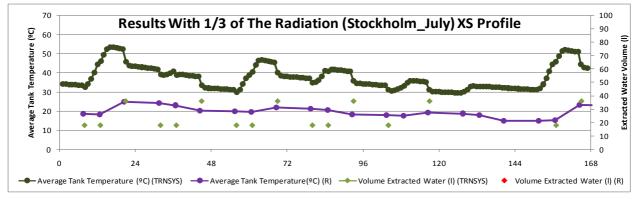


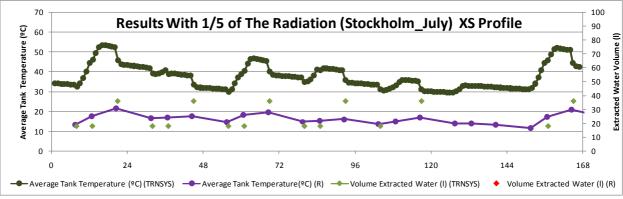


1.1.2 July 1st week





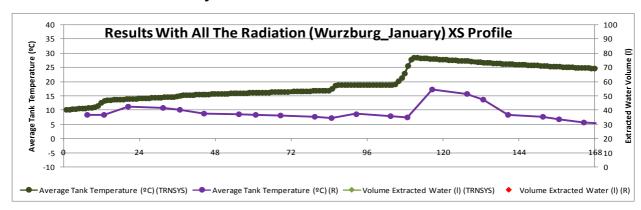


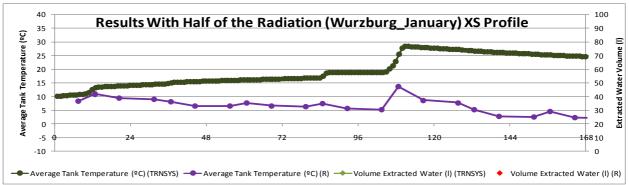


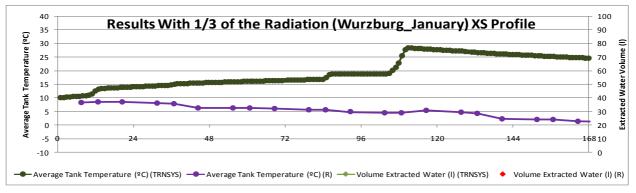


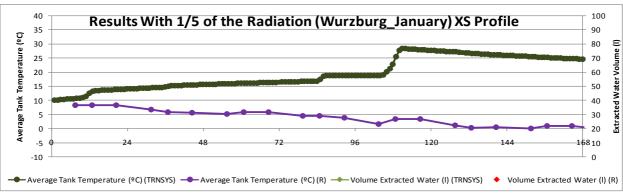
1.2 Würzburg results

1.2.1 January 1st week



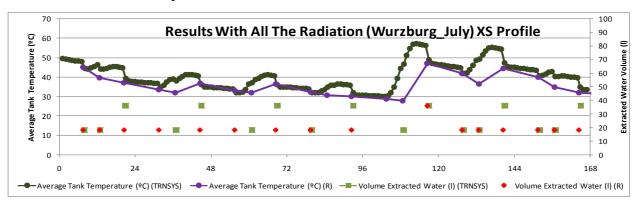


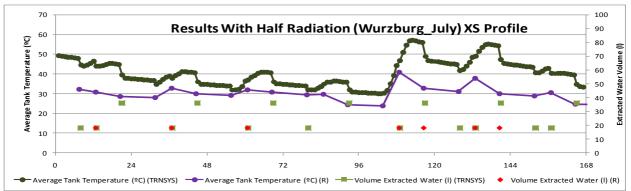


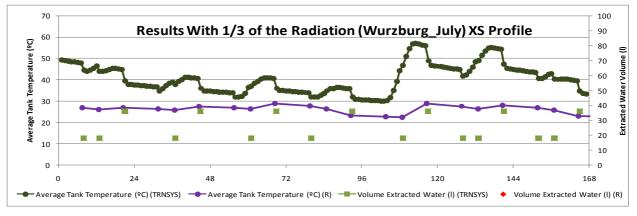


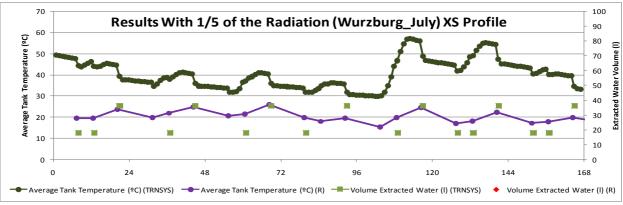


1.2.2 July 1st week





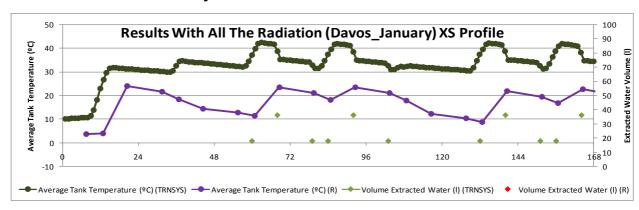


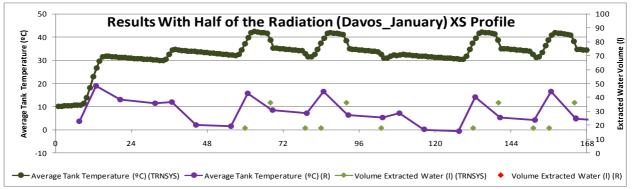


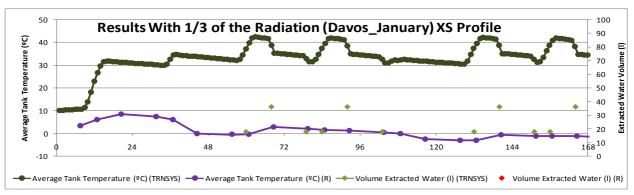


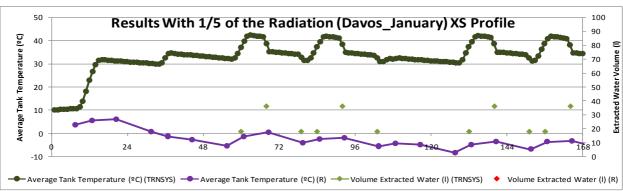
1.3 Davos results

1.3.1 January 1st week



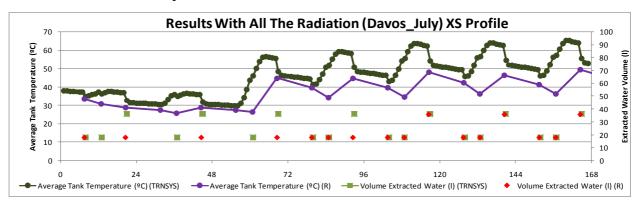


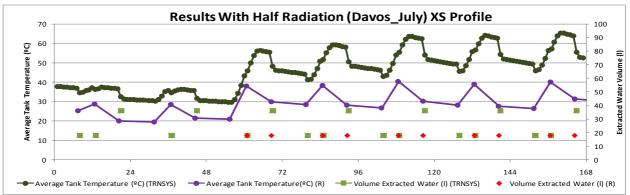


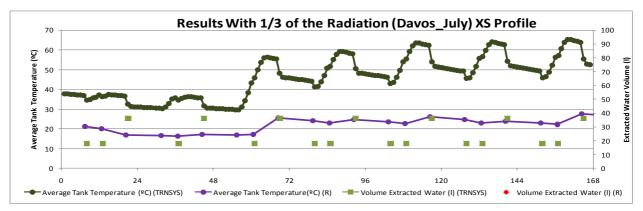


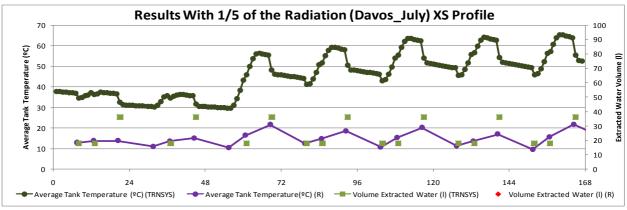


1.3.2 July 1st week





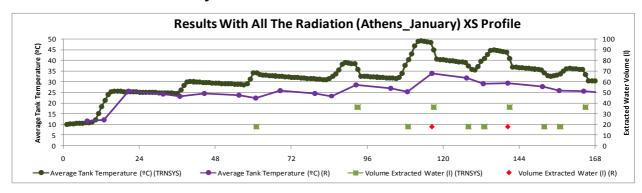


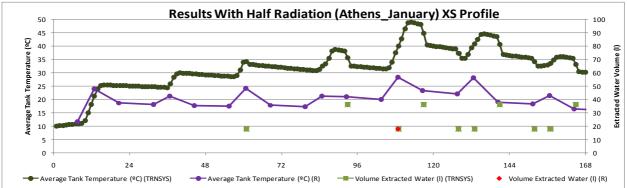


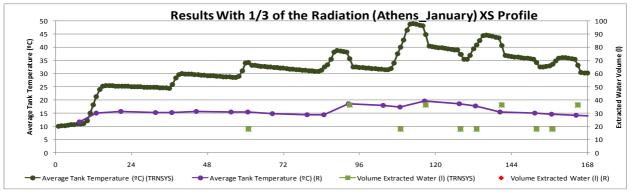


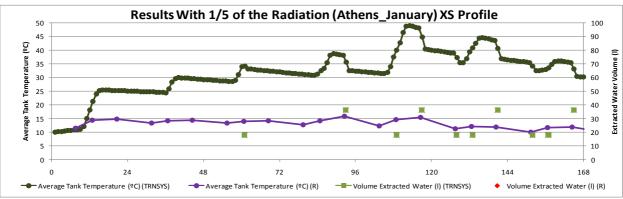
1.4 Athens results

1.4.1 January 1st week



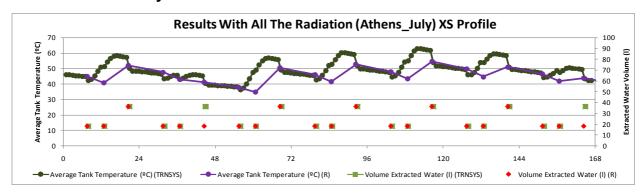


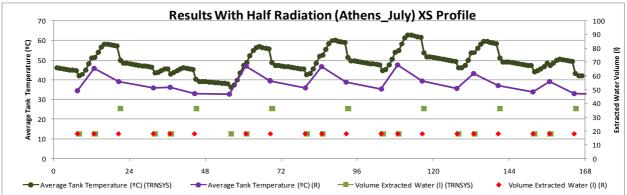


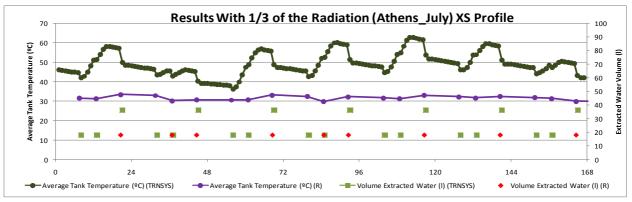


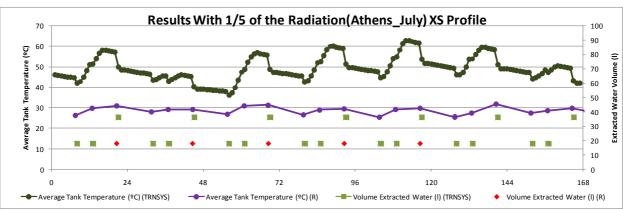


1.4.2 July 1st week





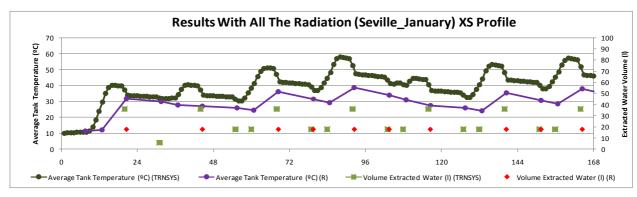


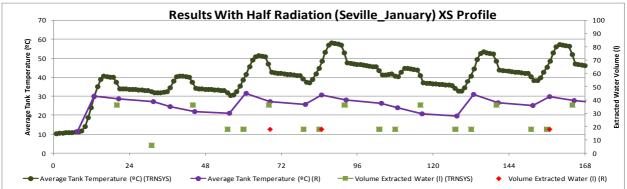


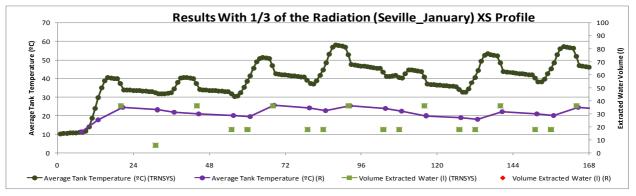


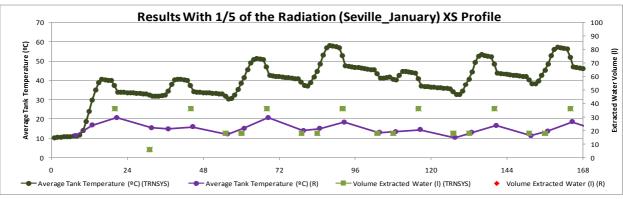
1.5 Seville results

1.5.1 January 1st week



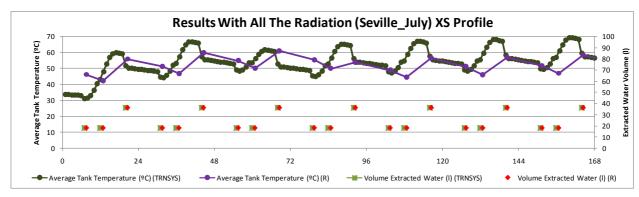


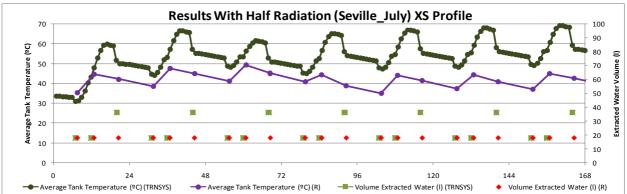


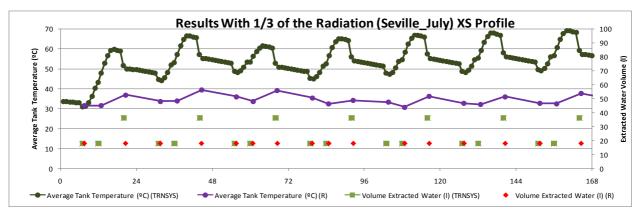


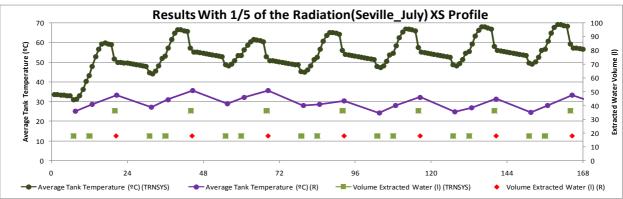


1.5.2 July 1st week





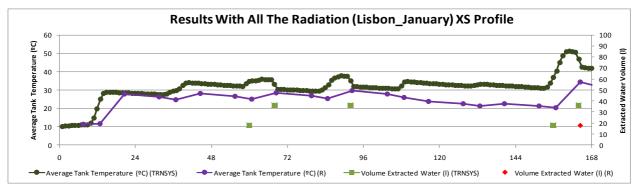


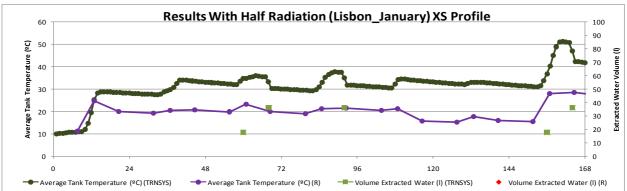


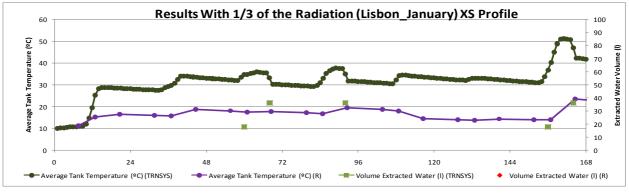


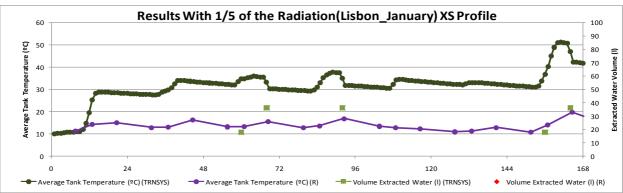
1.6 Lisbon results

1.6.1 January 1st week



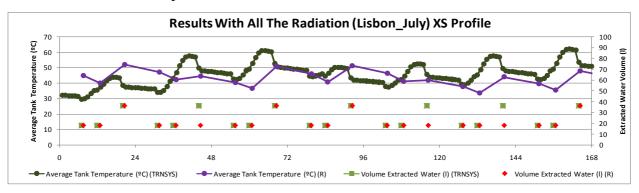


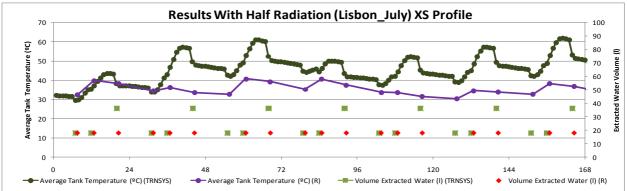


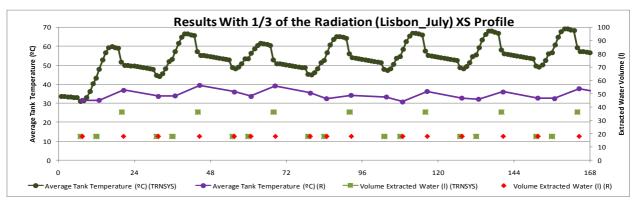


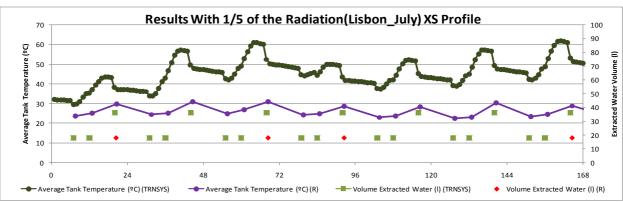


1.6.2 July 1st week











2 ANNEX 2 - Solahart 180 J

2.1 Manufacturer technical data:

The following technical data from the Solahart manufacturer has been used in this study:

• Collector gross area: 1,95 m²

• Collector dimensions: 1937x1022x77 mm

• Storage tank volume: 180 l

Storage tank position: horizontal

Storage tank dimensions: 1062x510x510 mm

Efficiency slope of the performance curve: 6,254 W/m²K

The y-intercept of the collector efficiency curve: 0,835.

Incident angle modifier constant: 0,19794

Collector tilt: 45°.

Inlet and outlet pipe loss coefficient: 8,3439 W/m²K

Overall loss coefficient for the storage tank: 2,06 W/K

Without auxiliary heater

Model		150 tank	151 system	180 tank	181 system	182 system	220 tank	221 system	222 system	300 tank	301 system	302 system	303 system	440 tank	443 system	444 system
Tank model																
J		150J	1	180J	/	/	220J	✓	/	300J	/	✓	1	440J	/	/
J Free Heat		150F		180F	/	✓	220F	✓	✓	300F		✓	✓	440F	/	✓
Collector model			J		J	J		J	J		J	J	J		J	J
No of collectors			1		1	2		1	2		1	2	3		3	4
HartStat OTP	optional	-	1	-	/	✓	-	NA	✓	-	NA	✓	✓	-	✓	/
Storage capacity	litres	150	150	180	180	180	220	220	220	300	300	300	300	440	440	440
Storage capacity	US gal	40	40	48	48	48	58	58	58	80	80	80	80	116	116	116
Delivery capacity	litres	130	130	160	160	160	200	200	200	260	260	260	260	400	400	400
(solar)	US gal	34	34	42	42	42	53	53	53	68	68	68	68	106	106	106
Boost capacity	litres	75	75	90	90	90	110	110	110	150	150	150	150	220	220	220
(electric or gas)	US gal	20	20	24	24	24	29	29	29	40	40	40	40	58	58	58
Weight empty	kg	56	102	66	108	154	78	124	170	99	145	187	229	148	290	320
Weight empty	lbs	123	225	146	238	340	172	273	375	218	320	412	505	326	639	705
Weight full	kg	206	256	245	292	338	298	348	394	399	449	495	541	588	730	776
Weight full	lbs	454	564	540	644	745	657	767	869	880	990	1091	1193	1296	1609	1711
A – Width*	m	1.40	1.40	1.62	1.62	2.42	1.88	2.04	2.42	2.43	2.43	2.43	3.38	3.41	3.49	4.44
. mun	in	55.1	55.1	63.8	63.8	95.3	74.0	80.3	95.3	95.7	95.7	95.7	133.1	134.3	137.4	174.8
B – Length*	m	0.51	2.63	0.51	2.63	2.63	0.51	1.64	2.63	0.51	1.64	2.63	2.63	0.51	2.63	2.63
D - Longai	in	20.1	103.5	20.1	103.5	103.5	20.1	64.6	103.5	20.1	64.6	103.5	103.5	20.1	103.5	103.5

*An additional 0.9m (35.4in) should be left on all four sides of the installation for safe access and servicing.
The J and J Free Heat systems (if installed with a HartStat OTP system) can be installed as a solar preheater with an in-line Solahart gas booster water heater.
Refer to the Solahart gas booster specification sheet for further details on the gas booster.

NA - Not available



J Collector					
Aperture (heating) area	m ²	1.87	ft²	20	
Dimensions length	mm	1937	in	76.3	
width	mm	1022	in	40.3	
height	mm	77	in	3.0	
Capacity	litres	3.5	US gal	0.9	
Weight empty	kg	42	lbs	93	
full	kg	46	Ibs	101	
Working pressure	kPa	80	psi	12	
Absorber surface		Black polyester powder coat			
Absorber material		steel			
Riser material		steel			
Number of risers		35			
Tray material		0.7mm aluminium			
Insulation material (base)		38mm polyester blanket			
Glass		3.2mm tempered low iron			

J and J Free Heat
MANAGASTICITY P

Electric Boost Specifications							
Heating uni	t type *	Copper sheath immersion element					
Supply volta	age	220 V - 250 V					
	Recovery rate	@ 240 V and tem	perature rise of	f:			
Rating kW	Current Amps	30°C 40°C 50° litres/hour litres/hour litres/h					
1.8	8	51	39	31			
2.4	10	68	52	41			
3.0	13	86	64	52			
3.6	15	103	77	62			
4.8	20	137	103	83			

*A bobbin element (2.5 kW) is available for hard or corrosive water areas

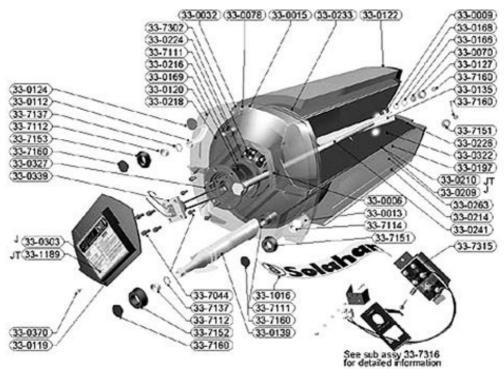
Gas Boost (In Tank - Optional) Specifications					
Model type* FD15 gas booster fan forced					
Burner rating - Input / Output	13 MJ/h / 10 MJ/h (2.8kW)				
Recovery rate	59 litres per hour @ 40°C rise				
Primary voltage	220 V - 250 V				
Secondary voltage	12 V DC				

*Suitable for hard or corrosive water areas

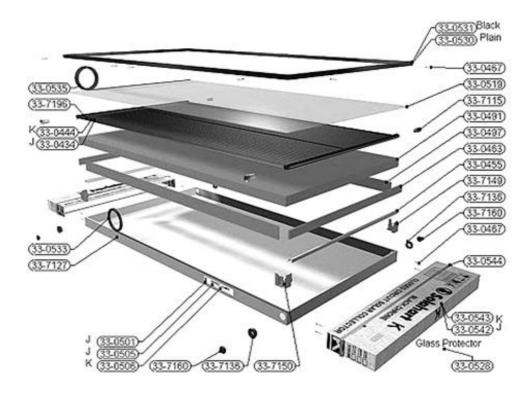
Water Supply					
TPR valve setting	kPa	1000	psi	145	
ECV* setting	kPa	850	psi	125	
Max. supply pressure					
with ECV	kPa	680	psi	100	
without ECV	kPa	800	psi	115	
Water Connections	cold		RP 3/4 / 20		
	hot		R ½ /15		

*Expansion Control Valve









2.2 CSTG test results





The CSTG test results for the Solahart 180J Thermosiphon system are:

- CSTG performance test parameters: a_1 =0,9766712, a_2 =0,3745053 and a_3 =-0,1650541
- The storage tank heat loss coefficient is: U_s=3,6557 W/K



- Cold water temperature of is: t_{main}=10±2 °C
- The values of the normalized draw-off temperature profile f(V) values each tenth of the storage tank volume (V_s) and interpolated among them every V_s centh. The f (V) values are given for the daily irradiance ranges: from 8 MJ/m² to 16 MJ/m² and from 16 MJ/m² to 25 MJ/m²:

f(V) for 1/10_Vs	
H ≥ 16 MJ	H < 16 MJ
0,10347623	0,11130203
0,10258455	0,11072659
0,10128982	0,10544729
0,09905603	0,1018398
0,09708699	0,09720469
0,09490326	0,09184529
0,09229965	0,08407911
0,08484231	0,06945758
0,06551195	0,0494434
0,04048087	0,03219412
0,0234717	0,02275453
0,01592402	0,01759445
0,0117969	0,01404462
0,00936776	0,01166695
0,00771179	0,0101662
0,00653109	0,00877318
0,00589734	0,00797335
0,00500447	0,00702607
0,00458831	0,00624612
0,00398809	0,00560088
0,00353276	0,0050819
0,00324347	0,00456744
0,00291264	0,00416484
0,00264959	0,00376626



0,00240467	0,00341951
0,00220965	0,00315794
0,0020266	0,00293051
0,00186313	0,00271013
0,00173613	0,00249516
0,00160022	0,00231197

The previous table shows the f(V) values at volume intervals of every tenth of the tank volume (V_s) .

• The values of the normalized mixing draw-off profile expressed as a function of the storage tank extracted volume, The g(V) values are known each V_s tenth:

g(V) for 1/10_Vs
0,10335833
0,10333885
0,10332555
0,10329649
0,10324224
0,1030651
0,10195262
0,09390334
0,06953657
0,03886318
0,02000076
0,01153071
0,00780698
0,00581182
0,00469785
0,00390752
0,00340576
0,00286559



0,00244326
0,00224675
0,00185757
0,00171956
0,00143215
0,00126035
0,0011218
0,00101434
0,00085241
0,00080792
0,00070726
0,00062641

In this case shows the g(V) values at volume intervals of every tenth of the tank volume (Vs).

In a graphic format the f(V) and g(V) profiles for every tenth of the tank volume for the TS SolaHart 180J are the following ones:

