

Appendix 1



Watts Close

RESIDENTIAL UNITS - SAP 10							
Plot Name	AREA (2)	TER <i>Part L 2013 Baseline</i> (3)	Total TER	DER 'Be Lean' (4)	Total DER 'Be Lean'	DER 'Be Green' (4)	Total DER <i>Green'</i> 'Be
	m²	kg CO2/m²/yr	kg CO2/yr	kg CO2/m²/yr	kg CO2/yr	kg CO2/m²/yr	kg CO2/yr
Unit 01 - GF	55.1	21.82	1202.47	16.84	927.61	-2.53	-139.48
Unit 02 - GF	68	18.68	1270.48	14.23	967.96	-1.82	-123.97
Unit 03 - FF	75.9	17.09	1296.95	12.38	939.43	-1.94	-147.19
Unit 04 - FF	77.3	16.35	1263.48	11.77	909.70	-2.01	-155.34
Unit 05 - SF	75.9	18.60	1411.80	13.97	1060.69	-1.39	-105.29
Unit 06 - SF	77.3	18.67	1443.56	14.08	1088.57	-1.23	-95.44
Unit 07 - GF	99.5	15.53	1545.51	11.04	1098.09	-0.71	-70.38
Unit 08 - GF	99.5	15.08	1500.72	10.73	1067.44	-0.79	-78.55
Unit 09 - GF	99.5	15.08	1500.72	10.73	1067.44	-1.06	-105.16
Unit 10 - GF	99.5	15.53	1545.51	11.04	1098.09	-0.97	-96.24
Unit 11 - GF	55.1	21.82	1202.47	16.84	927.61	-2.53	-139.48
Unit 12 - GF	68	18.68	1270.48	14.23	967.96	-1.82	-123.97
Unit 13 - FF	75.9	17.09	1296.95	12.38	939.43	-1.94	-147.19
Unit 14 - FF	77.3	16.35	1263.48	11.77	909.70	-2.01	-155.34
Unit 15 - SF	75.9	18.60	1411.80	13.97	1060.69	-1.39	-105.29
Unit 16 - SF	77.3	18.67	1443.56	14.08	1088.57	-1.23	-95.44
Unit 17 - GF	119.6	15.55	1859.77	10.80	1291.57	-0.38	-45.01
Unit 18 - GF	119.6	15.55	1859.77	10.80	1291.57	-0.38	-45.01
Total Area Assessed	1,496		25,589		18,702		-1,974
		Average	1m2 TER			1m2 DER	1m2 DER
			17.10			12.50	-1.32
Total Site Area (m²):	1,496	TOTAL TER CO2:	25,589	TOTAL DER CO2:	18,702	TOTAL DER CO2:	-1,974

Total Site TER	25,589	kg CO2/yr
Total Site DER - Be Lean	18,702	kg CO2/yr
CO2 Savings at 'Be Lean'	26.91%	%

Final CO2 Emissions at 'Be Green'	-1,974	kg CO2/yr
Total CO2 Savings at 'Be Green'	107.71	%

Carbon Offsetting Contribution	£0	£
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Appendix 2



FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 02 - GF			Issued on Date	22/09/2022
Assessment Reference	001	Prop Type Ref			
Property					
SAP Rating	89 B	DER	-4.06	TER	30.07
Environmental	105 A	% DER<TER	113.50		
CO ₂ Emissions (t/year)	-0.53	DFEE	43.00	TFEE	58.90
General Requirements Compliance	Pass	% DFEE<TFEE	26.99		
Assessor Details	Mr. Edward Coate, Edward Coate, Tel: 07427310051, ed.coate@nrgconsulting.org			Assessor ID	Z417-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Ground-floor flat, total floor area 68 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 30.07 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) -4.06 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)58.9 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)43.0 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.17 (max. 0.70)	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	(no roof)		
Openings	1.01 (max. 2.00)	1.14 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with warm air distribution with radiators or underfloor - Electric
Nilan Compact P 7512404

Secondary heating system: None

5 Cylinder insulation

Hot water storage No cylinder

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: No cylinder

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system

Specific fan power:	0.73	
Maximum	1.5	OK
MVHR efficiency:	85%	
Minimum:	70%	OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	5.47 m ² , No overhang
Windows facing South:	2.31 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Floor U-value	0.09 W/m ² K
Door U-value	1.14 W/m ² K
Window U-value	0.97 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	3.12 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.0000 (1b)	x 2.8000 (2b)	= 190.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.4000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					0 * 10 = 0.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				0.0000 / (5) = 0.0000 (8)
Pressure test					Yes
Measured/design AP50					3.0000
Infiltration rate					0.1500 (18)
Number of sides sheltered					2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.1275 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1626	0.1594	0.1562	0.1403	0.1371	0.1211	0.1211	0.1179	0.1275	0.1371	0.1434	0.1498 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If mechanical ventilation:												0.5000 (23b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												72.2500 (23c)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												
Effective ac	0.3013	0.2981	0.2949	0.2790	0.2758	0.2599	0.2599	0.2567	0.2663	0.2758	0.2822	0.2886 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 2 (Uw = 0.97)			7.7800	0.9338	7.2647		(27)					
Opening Type 3			2.4000	1.1400	2.7360		(26)					
Heat Loss Floor 1			68.0000	0.0900	6.1200		(28a)					
External Wall 1	48.1600	10.1800	37.9800	0.1600	6.0768		(29a)					
External Wall 2	34.4400		34.4400	0.1700	5.8548		(29a)					
Total net area of external elements Aum(A, m2)			150.6000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	28.0523		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.3304 (36)					
Total fabric heat loss							(33) + (36) = 37.3827 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	18.9321	18.7318	18.5315	17.5301	17.3299	16.3285	16.3285	16.1282	16.7290	17.3299	17.7304	18.1310 (38)
Heat transfer coeff	56.3148	56.1145	55.9142	54.9129	54.7126	53.7112	53.7112	53.5109	54.1117	54.7126	55.1131	55.5137 (39)
Average = Sum(39)m / 12 =												54.8628 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	0.8282	0.8252	0.8223	0.8075	0.8046	0.7899	0.7899	0.7869	0.7958	0.8046	0.8105	0.8164 (40)
HLP (average)												0.8068 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1966 (42)
Average daily hot water use (litres/day)												86.3694 (43)
Daily hot water use	95.0064	91.5516	88.0968	84.6420	81.1872	77.7325	77.7325	81.1872	84.6420	88.0968	91.5516	95.0064 (44)
Energy conte	140.8917	123.2248	127.1569	110.8585	106.3713	91.7904	85.0573	97.6045	98.7702	115.1071	125.6484	136.4461 (45)
Energy content (annual)												Total = Sum(45)m = 1358.9271 (45)
Distribution loss (46)m = 0.15 x (45)m	21.1338	18.4837	19.0735	16.6288	15.9557	13.7686	12.7586	14.6407	14.8155	17.2661	18.8473	20.4669 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												0.8400 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.4536 (55)
Total storage loss												
14.0616	12.7008	14.0616	13.6080	14.0616	13.6080	14.0616	14.0616	13.6080	14.0616	13.6080	14.0616	(56)
If cylinder contains dedicated solar storage												
14.0616	12.7008	14.0616	13.6080	14.0616	13.6080	14.0616	14.0616	13.6080	14.0616	13.6080	14.0616	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month												
154.9533	135.9256	141.2185	124.4665	120.4329	105.3984	99.1189	111.6661	112.3782	129.1687	139.2564	150.5077	(62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
154.9533	135.9256	141.2185	124.4665	120.4329	105.3984	99.1189	111.6661	112.3782	129.1687	139.2564	150.5077	(64)
Total per year (kWh/year) = Sum(64)m =												1524.4911 (64)
Heat gains from water heating, kWh/month												
46.8465	40.9722	42.2797	36.8604	35.3685	30.5203	28.2815	32.4535	32.8411	38.2731	41.7781	45.3683	(65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
19.8210	17.6048	14.3172	10.8390	8.1023	6.8403	7.3912	9.6074	12.8950	16.3731	19.1099	20.3719	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
192.5849	194.5833	189.5473	178.8263	165.2930	152.5736	144.0762	142.0778	147.1138	157.8348	171.3681	184.0875	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	(71)
Water heating gains (Table 5)												
62.9657	60.9706	56.8275	51.1951	47.5383	42.3893	38.0128	43.6203	45.6126	51.4424	58.0251	60.9789	(72)
Total internal gains												
331.3207	329.1078	316.6412	296.8095	276.8827	257.7523	245.4294	251.2545	261.5705	281.5994	304.4522	321.3874	(73)

6. Solar gains

[Jan]		Area	Solar flux									
		m2	Table 6a	Specific data	g	Specific data	FF	Access				
			W/m2	or Table 6b		or Table 6c		factor				
								Table 6d				
North		5.4700	10.6334	0.6400		0.7000		0.7700			18.0580	(74)
South		2.3100	46.7521	0.6400		0.7000		0.7700			33.5293	(78)
Solar gains												
51.5873	89.4221	128.5891	173.2489	209.2674	215.1160	204.2817	175.8418	143.5745	100.3075	62.0205	44.0264	(83)
Total gains												
382.9080	418.5299	445.2303	470.0584	486.1501	472.8683	449.7111	427.0963	405.1450	381.9069	366.4727	365.4138	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Thl (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.8540	84.1533	84.4547	85.9948	86.3096	87.9188	87.9188	88.2478	87.2680	86.3096	85.6823	85.0641
alpha	6.5903	6.6102	6.6303	6.7330	6.7540	6.8613	6.8613	6.8832	6.8179	6.7540	6.7122	6.6709
util living area												
0.9984	0.9967	0.9914	0.9694	0.8900	0.7027	0.5225	0.5708	0.8338	0.9767	0.9963	0.9988	(86)
Tweekday												
19.3386	19.4558	19.6450	19.9084	20.1049	20.1952	20.2034	20.2055	20.1662	19.9330	19.6029	19.3305	
Tweekend												
20.5763	20.6273	20.7104	20.8248	20.9195	20.9661	20.9734	20.9727	20.9487	20.8339	20.6876	20.5689	
24 / 16	9	8	9	8	9	9	9	8	9	8	9	
24 / 9	22	20	22	22	22	21	22	22	22	22	22	
16 / 9	0	0	0	0	0	0	0	0	0	0	0	
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	(87)
Th 2	20.2290	20.2315	20.2341	20.2468	20.2494	20.2621	20.2621	20.2647	20.2570	20.2494	20.2443	(88)
util rest of house												
0.9979	0.9956	0.9885	0.9585	0.8536	0.6317	0.4365	0.4825	0.7732	0.9662	0.9949	0.9984	(89)
Tweekday												
19.3386	19.4558	19.6450	19.9084	20.1049	20.1952	20.2034	20.2055	20.1662	19.9330	19.6029	19.3305	
Tweekend												
20.5763	20.6273	20.7104	20.8248	20.9195	20.9661	20.9734	20.9727	20.9487	20.8339	20.6876	20.5689	
MIT 2	20.2290	20.2315	20.2341	20.2468	20.2494	20.2621	20.2621	20.2647	20.2570	20.2494	20.2443	(90)
Living area fraction												
fLA = Living area / (4) =												(91)
MIT	20.5714	20.5728	20.5742	20.5813	20.5827	20.5898	20.5898	20.5912	20.5870	20.5827	20.5799	(92)
Temperature adjustment												
adjusted MIT	20.5714	20.5728	20.5742	20.5813	20.5827	20.5898	20.5898	20.5912	20.5870	20.5827	20.5799	(93)

8. Space heating requirement

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9981	0.9961	0.9899	0.9638	0.8709	0.6641	0.4750	0.5221	0.8018	0.9714	0.9956	0.9986 (94)
Useful gains	382.1979	416.9047	440.7441	453.0342	423.3865	314.0280	213.6026	223.0053	324.8514	370.9737	364.8483	364.9135 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
916.3212	879.4730	786.9502	641.4541	485.9969	321.7207	214.2983	224.2775	351.0221	546.1808	742.9192	909.1512	(97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh												

FULL SAP CALCULATION PRINTOUT

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CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

	397.3878	310.8459	257.5774	135.6623	46.5822	0.0000	0.0000	0.0000	0.0000	130.3541	272.2111	404.9128 (98)
Space heating												1955.5335 (98)
Space heating per m2											(98) / (4) =	28.7578 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												308.5133 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												633.8571 (211)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	397.3878	310.8459	257.5774	135.6623	46.5822	0.0000	0.0000	0.0000	0.0000	130.3541	272.2111	404.9128 (98)
Space heating efficiency (main heating system 1)	308.5133	308.5133	308.5133	308.5133	308.5133	0.0000	0.0000	0.0000	0.0000	308.5133	308.5133	308.5133 (210)
Space heating fuel (main heating system)	128.8073	100.7561	83.4899	43.9729	15.0989	0.0000	0.0000	0.0000	0.0000	42.2523	88.2332	131.2465 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	154.9533	135.9256	141.2185	124.4665	120.4329	105.3984	99.1189	111.6661	112.3782	129.1687	139.2564	150.5077 (64)
Efficiency of water heater (217)m	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800	194.1800 (216)
Fuel for water heating, kWh/month	79.7988	69.9998	72.7256	64.0985	62.0213	54.2787	51.0448	57.5065	57.8732	66.5201	71.7151	77.5094 (219)
Water heating fuel used												785.0917 (219)
Annual totals kWh/year												
Space heating fuel - main system												633.8571 (211)
Space heating fuel - secondary												0.0000 (215)

Electricity for pumps and fans:
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.9125)
mechanical ventilation fans (SFP = 0.9125)

	71.6919 (230a)
Total electricity for the above, kWh/year	71.6919 (231)
Electricity for lighting (calculated in Appendix L)	350.0444 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
PV Unit 0 (0.80 * 3.12 * 951 * 1.00) =

	-2372.7375 (233)
Total delivered energy for all uses	-532.0524 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	633.8571	0.5190	328.9718 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	785.0917	0.5190	407.4626 (264)
Space and water heating			736.4344 (265)
Pumps and fans	71.6919	0.5190	37.2081 (267)
Energy for lighting	350.0444	0.5190	181.6731 (268)
Energy saving/generation technologies			
PV Unit	-2372.7375	0.5190	-1231.4508 (269)
Total CO2, kg/year			-276.1352 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			-4.0600 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER	-4.0600 ZC1
Total Floor Area	TFA 68.0000
Assumed number of occupants	N 2.1966
CO2 emission factor in Table 12 for electricity displaced from grid	EF 0.5190
CO2 emissions from appliances, equation (L14)	16.7826 ZC2
CO2 emissions from cooking, equation (L16)	2.5253 ZC3
Total CO2 emissions	15.2479 ZC4
Residual CO2 emissions offset from biofuel CHP	0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year	0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation	0.0000 ZC7
Net CO2 emissions	15.2479 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	68.0000 (1b)	x 2.8000 (2b)	= 190.4000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	68.0000		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 190.4000 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m ³ per hour
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)
Number of intermittent fans					2 * 10 = 20.0000 (7a)
Number of passive vents					0 * 10 = 0.0000 (7b)
Number of flueless gas fires					0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(7a)+(7b)+(7c) =					20.0000 / (5) = 0.1050 (8)
Pressure test					Yes
Measured/design AP50					5.0000
Infiltration rate					0.3550 (18)
Number of sides sheltered					2 (19)
Shelter factor					(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor					(21) = (18) x (20) = 0.3018 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate												
Effective ac	0.3848	0.3772	0.3697	0.3320	0.3244	0.2867	0.2867	0.2792	0.3018	0.3244	0.3395	0.3546 (22b)
Effective ac	0.5740	0.5712	0.5683	0.5551	0.5526	0.5411	0.5411	0.5390	0.5455	0.5526	0.5576	0.5629 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
TER Opaque door			2.4000	1.0000	2.4000		(26)
TER Opening Type (Uw = 1.40)			7.7800	1.3258	10.3144		(27)
Heat Loss Floor 1			68.0000	0.1300	8.8400		(28a)
External Wall 1	48.1600	10.1800	37.9800	0.1800	6.8364		(29a)
External Wall 2	34.4400		34.4400	0.1800	6.1992		(29a)
Total net area of external elements Aum(A, m ²)			150.6000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 34.5900		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							250.0000 (35)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							9.9770 (36)
Total fabric heat loss							(33) + (36) = 44.5670 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(38)m	36.0672	35.8866	35.7096	34.8781	34.7225	33.9982	33.9982	33.8641	34.2772	34.7225	35.0372	35.3662 (38)
Heat transfer coeff	80.6342	80.4536	80.2766	79.4450	79.2895	78.5652	78.5652	78.4311	78.8442	79.2895	79.6042	79.9332 (39)
Average = Sum(39)m / 12 =												79.4443 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.1858	1.1831	1.1805	1.1683	1.1660	1.1554	1.1554	1.1534	1.1595	1.1660	1.1707	1.1755 (40)
HLP (average)												1.1683 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.1966 (42)
Average daily hot water use (litres/day)												86.3694 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	95.0064	91.5516	88.0968	84.6420	81.1872	77.7325	77.7325	81.1872	84.6420	88.0968	91.5516	95.0064 (44)
Energy conte	140.8917	123.2248	127.1569	110.8585	106.3713	91.7904	85.0573	97.6045	98.7702	115.1071	125.6484	136.4461 (45)
Energy content (annual)										Total = Sum(45)m =		1358.9271 (45)
Distribution loss (46)m = 0.15 x (45)m	21.1338	18.4837	19.0735	16.6288	15.9557	13.7686	12.7586	14.6407	14.8155	17.2661	18.8473	20.4669 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	187.4866	165.3105	173.7518	155.9503	152.9663	136.8822	131.6522	144.1994	143.8620	161.7020	170.7403	183.0410 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	187.4866	165.3105	173.7518	155.9503	152.9663	136.8822	131.6522	144.1994	143.8620	161.7020	170.7403	183.0410 (64)
Heat gains from water heating, kWh/month	84.1224	74.6408	79.5556	72.9339	72.6444	66.5938	65.5575	69.7294	68.9146	75.5490	77.8516	82.6442 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303	109.8303 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	19.2586	17.1054	13.9110	10.5315	7.8724	6.6462	7.1815	9.3348	12.5291	15.9086	18.5677	19.7939 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	192.5849	194.5833	189.5473	178.8263	165.2930	152.5736	144.0762	142.0778	147.1138	157.8348	171.3681	184.0875 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830	33.9830 (69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643	-87.8643 (71)
Water heating gains (Table 5)	113.0677	111.0726	106.9296	101.2971	97.6403	92.4914	88.1149	93.7223	95.7147	101.5444	108.1272	111.0810 (72)
Total internal gains	383.8604	381.7104	369.3370	349.6041	329.7549	310.6603	298.3217	304.0840	314.3067	334.2369	357.0121	373.9115 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	Specific data g or Table 6b	Specific data FF or Table 6c	Access factor Table 6d		Gains W	
North					5.4700	10.6334	0.6300	0.7000	0.7700		17.7759 (74)	
South					2.3100	46.7521	0.6300	0.7000	0.7700		33.0054 (78)	
Solar gains	50.7812	88.0249	126.5799	170.5419	205.9976	211.7548	201.0898	173.0943	141.3312	98.7402	61.0514	43.3385 (83)
Total gains	434.6416	469.7353	495.9170	520.1460	535.7525	522.4151	499.4115	477.1783	455.6379	432.9771	418.0636	417.2500 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.5635	58.6950	58.8244	59.4401	59.5567	60.1058	60.1058	60.2085	59.8931	59.5567	59.3213	59.0771
alpha	4.9042	4.9130	4.9216	4.9627	4.9704	5.0071	5.0071	5.0139	4.9929	4.9704	4.9548	4.9385
util living area	0.9974	0.9956	0.9913	0.9776	0.9344	0.8172	0.6543	0.7003	0.8976	0.9803	0.9950	0.9979 (86)
MIT	19.7471	19.8638	20.0765	20.3768	20.6739	20.8953	20.9739	20.9633	20.8138	20.4489	20.0499	19.7263 (87)
Th 2	19.9314	19.9335	19.9356	19.9454	19.9473	19.9559	19.9559	19.9575	19.9526	19.9473	19.9436	19.9397 (88)
util rest of house	0.9965	0.9941	0.9881	0.9682	0.9036	0.7325	0.5175	0.5676	0.8384	0.9700	0.9929	0.9971 (89)
MIT 2	18.2687	18.4405	18.7516	19.1916	19.6047	19.8789	19.9454	19.9409	19.7921	19.2996	18.7197	18.2441 (90)
Living area fraction									fLA = Living area / (4) =			0.4441 (91)
MIT	18.9253	19.0726	19.3400	19.7180	20.0796	20.3303	20.4021	20.3950	20.2459	19.8100	19.3104	18.9024 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9253	19.0726	19.3400	19.7180	20.0796	20.3303	20.4021	20.3950	20.2459	19.8100	19.3104	18.9024 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	432.5823	466.1761	488.7984	502.2606	486.5468	400.1930	289.1213	299.1422	390.7956	419.2554	414.3962	415.6285 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	1179.2961	1140.2381	1030.7527	859.4329	664.4111	450.2007	298.7164	313.3292	484.5652	730.2567	972.0027	1175.2093 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)
Space heating kWh	555.5550	452.9697	403.2140	257.1641	132.3310	0.0000	0.0000	0.0000	0.0000	231.3849	401.4767	565.1282 (98)
Space heating												2999.2237 (98)
Space heating per m2										(98) / (4) =		44.1062 (99)

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													3207.7258 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	555.5550	452.9697	403.2140	257.1641	132.3310	0.0000	0.0000	0.0000	0.0000	231.3849	401.4767	565.1282	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	594.1765	484.4596	431.2449	275.0418	141.5305	0.0000	0.0000	0.0000	0.0000	247.4705	429.3869	604.4152	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	187.4866	165.3105	173.7518	155.9503	152.9663	136.8822	131.6522	144.1994	143.8620	161.7020	170.7403	183.0410	(64)
Efficiency of water heater (217)m	87.5383	87.3678	86.9875	86.1399	84.4302	79.8000	79.8000	79.8000	79.8000	85.7692	87.0185	79.8000	(216)
Fuel for water heating, kWh/month	214.1765	189.2121	199.7434	181.0432	181.1749	171.5316	164.9777	180.7010	180.2782	188.5317	196.2115	208.8900	(219)
Water heating fuel used												2256.4718	(219)
Annual totals kWh/year													
Space heating fuel - main system												3207.7258	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												340.1135	(232)
Total delivered energy for all uses												5879.3112	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3207.7258	0.2160	692.8688 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2256.4718	0.2160	487.3979 (264)
Space and water heating			1180.2667 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	340.1135	0.5190	176.5189 (268)
Total CO2, kg/m2/year			1395.7106 (272)
Emissions per m2 for space and water heating			17.3569 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			2.5959 (272b)
Emissions per m2 for pumps and fans			0.5724 (272c)
Target Carbon Dioxide Emission Rate (TER) = (17.3569 * 1.55) + 2.5959 + 0.5724, rounded to 2 d.p.			30.0700 (273)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

Property Reference	Unit 17 - GF			Issued on Date	22/09/2022
Assessment Reference	001	Prop Type Ref			
Property					
SAP Rating	91 B	DER	-0.84	TER	25.05
Environmental	102 A	% DER<TER	103.35		
CO ₂ Emissions (t/year)	-0.40	DFEE	39.79	TFEE	57.53
General Requirements Compliance	Pass	% DFEE<TFEE	30.84		
Assessor Details	Mr. Edward Coate, Edward Coate, Tel: 07427310051, ed.coate@nrgconsulting.org			Assessor ID	Z417-0001
Client					

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

REGULATIONS COMPLIANCE REPORT - Approved Document L1A, 2013 Edition, England

DWELLING AS DESIGNED

Semi-Detached House, total floor area 120 m²

This report covers items included within the SAP calculations.
It is not a complete report of regulations compliance.

1a TER and DER

Fuel for main heating:Electricity

Fuel factor:1.55 (electricity)

Target Carbon Dioxide Emission Rate (TER) 25.05 kgCO₂/m²

Dwelling Carbon Dioxide Emission Rate (DER) -0.84 kgCO₂/m²OK

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)57.5 kWh/m²/yr

Dwelling Fabric Energy Efficiency (DFEE)39.8 kWh/m²/yrOK

2 Fabric U-values

Element	Average	Highest	
External wall	0.16 (max. 0.30)	0.16 (max. 0.70)	OK
Floor	0.09 (max. 0.25)	0.09 (max. 0.70)	OK
Roof	0.12 (max. 0.20)	0.12 (max. 0.35)	OK
Openings	0.98 (max. 2.00)	1.14 (max. 3.30)	OK

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals:	3.00 (design value)	
Maximum	10.0	OK

4 Heating efficiency

Main heating system: Heat pump with radiators or underfloor - Electric
Samsung Electronics AE080RXYDEG

Secondary heating system: None

5 Cylinder insulation

Hot water storage	Measured cylinder loss: 1.20 kWh/day	
Permitted by DBSCG 2.30	OK	
Primary pipework insulated:	Yes	OK

6 Controls

Space heating controls: Time and temperature zone control OK

Hot water controls: Cylinderstat OK
Independent timer for DHW OK

7 Low energy lights

Percentage of fixed lights with low-energy fittings:100%	
Minimum	75% OK

8 Mechanical ventilation

Continuous supply and extract system	
Specific fan power:	0.70
Maximum	1.5 OK
MVHR efficiency:	91%
Minimum:	70% OK

9 Summertime temperature

Overheating risk (Thames Valley): Not significant OK

Based on:

Overshading:	Average
Windows facing North:	7.88 m ² , No overhang
Windows facing South:	9.46 m ² , No overhang
Windows facing West:	8.98 m ² , No overhang
Air change rate:	6.00 ach
Blinds/curtains:	None

10 Key features

Roof U-value	0.12 W/m ² K
Floor U-value	0.09 W/m ² K
Door U-value	1.14 W/m ² K
Window U-value	0.97 W/m ² K
Air permeability	3.0 m ³ /m ² h
Photovoltaic array	3.12 kW

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.2000 (1b)	x 2.8000 (2b)	= 165.7600 (1b) - (3b)
First floor	60.4000 (1c)	x 3.0000 (2c)	= 181.2000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	119.6000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	346.9600 (5)

2. Ventilation rate

					main heating	secondary heating	other		total	m3 per hour		
Number of chimneys					0	+	0	+	0	=	0 * 40 =	0.0000 (6a)
Number of open flues					0	+	0	+	0	=	0 * 20 =	0.0000 (6b)
Number of intermittent fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans					= (6a)+(6b)+(7a)+(7b)+(7c) =					0.0000 / (5) =		0.0000 (8)
Pressure test										Yes		
Measured/design AP50												3.0000
Infiltration rate												0.1500 (18)
Number of sides sheltered												1 (19)
Shelter factor										(20) = 1 - [0.075 x (19)] =		0.9250 (20)
Infiltration rate adjusted to include shelter factor										(21) = (18) x (20) =		0.1388 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1769	0.1734	0.1700	0.1526	0.1492	0.1318	0.1318	0.1283	0.1388	0.1492	0.1561	0.1630 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation:												0.5000 (23a)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												77.3500 (23c)
Effective ac	0.2902	0.2867	0.2832	0.2659	0.2624	0.2451	0.2451	0.2416	0.2520	0.2624	0.2693	0.2763 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
Opening Type 1			2.4000	1.1400	2.7360		(26)					
Opening Type 2 (Uw = 0.97)			26.3200	0.9338	24.5768		(27)					
Heat Loss Floor 1			59.2000	0.0900	5.3280		(28a)					
External Wall 1	128.7000	28.7200	99.9800	0.1600	15.9968		(29a)					
External Roof 1	60.4000		60.4000	0.1200	7.2480		(30)					
Total net area of external elements Aum(A, m2)			248.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26) ... (30) + (32) =	55.8856		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.4501 (36)					
Total fabric heat loss						(33) + (36) =	66.3357 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 33.2220	Feb 32.8248	Mar 32.4276	Apr 30.4418	May 30.0447	Jun 28.0589	Jul 28.0589	Aug 27.6617	Sep 28.8532	Oct 30.0447	Nov 30.8390	Dec 31.6333 (38)
Heat transfer coeff	99.5577	99.1605	98.7634	96.7776	96.3804	94.3946	94.3946	93.9974	95.1889	96.3804	97.1747	97.9690 (39)
Average = Sum(39)m / 12 =												96.6783 (39)
HLP	Jan 0.8324	Feb 0.8291	Mar 0.8258	Apr 0.8092	May 0.8059	Jun 0.7893	Jul 0.7893	Aug 0.7859	Sep 0.7959	Oct 0.8059	Nov 0.8125	Dec 0.8191 (40)
HLP (average)												0.8083 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8618 (42)
Average daily hot water use (litres/day)												102.1667 (43)
Daily hot water use	Jan 112.3834	Feb 108.2967	Mar 104.2100	Apr 100.1234	May 96.0367	Jun 91.9500	Jul 91.9500	Aug 96.0367	Sep 100.1234	Oct 104.2100	Nov 108.2967	Dec 112.3834 (44)
Energy conte	166.6613	145.7630	150.4144	131.1349	125.8271	108.5792	100.6146	115.4567	116.8356	136.1607	148.6300	161.4026 (45)
Energy content (annual)										Total = Sum(45)m =		1607.4800 (45)
Distribution loss (46)m = 0.15 x (45)m	24.9992	21.8645	22.5622	19.6702	18.8741	16.2869	15.0922	17.3185	17.5253	20.4241	22.2945	24.2104 (46)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.2000 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.6480 (55)
Total storage loss												
	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (56)
If cylinder contains dedicated solar storage												
	20.0880	18.1440	20.0880	19.4400	20.0880	19.4400	20.0880	20.0880	19.4400	20.0880	19.4400	20.0880 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month												
	210.0117	184.9182	193.7648	173.0869	169.1775	150.5312	143.9650	158.8071	158.7876	179.5111	190.5820	204.7530 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Solar input (sum of months) = Sum(63)m =												0.0000 (63)
Output from w/h												
	210.0117	184.9182	193.7648	173.0869	169.1775	150.5312	143.9650	158.8071	158.7876	179.5111	190.5820	204.7530 (64)
Total per year (kWh/year) = Sum(64)m =												2117.8960 (64)
Heat gains from water heating, kWh/month												
	90.0952	79.7904	84.6931	77.1640	76.5178	69.6642	68.1347	73.0697	72.4094	79.9537	82.9811	88.3467 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	25.6718	22.8015	18.5434	14.0386	10.4940	8.8595	9.5730	12.4433	16.7014	21.2062	24.7508	26.3853 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	284.6915	287.6457	280.2012	264.3528	244.3469	225.5442	212.9829	210.0287	217.4732	233.3216	253.3275	272.1302 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)												
	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702 (71)
Water heating gains (Table 5)												
	121.0957	118.7357	113.8348	107.1722	102.8465	96.7558	91.5789	98.2119	100.5687	107.4647	115.2515	118.7455 (72)
Total internal gains	497.3854	495.1092	478.5058	451.4898	423.6138	397.0858	380.0610	386.6102	400.6696	427.9189	459.2561	483.1874 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	7.8800	10.6334	0.6400	0.7000	0.7700	26.0141 (74)
South	9.4600	46.7521	0.6400	0.7000	0.7700	137.3103 (78)
West	8.9800	19.6403	0.6400	0.7000	0.7700	54.7564 (80)
Solar gains						
	218.0809	381.7084	547.3360	716.7225	835.4626	843.1228
Total gains						
	715.4662	876.8176	1025.8418	1168.2123	1259.0763	1240.2086

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.4246	83.7587	84.0955	85.8211	86.1747	87.9876	87.9876	88.3594	87.2534	86.1747	85.4703	84.7774
alpha	6.5616	6.5839	6.6064	6.7214	6.7450	6.8658	6.8658	6.8906	6.8169	6.7450	6.6980	6.6518
util living area												
	0.9977	0.9912	0.9660	0.8715	0.6896	0.4853	0.3497	0.3914	0.6397	0.9284	0.9929	0.9985 (86)
Tweekday												
	19.3661	19.5692	19.8268	20.0809	20.1735	20.2037	20.2045	20.2075	20.1926	20.0458	19.6667	19.3472
Tweekend												
	20.5898	20.6791	20.7949	20.9118	20.9625	20.9734	20.9743	20.9743	20.9689	20.8898	20.7167	20.5772
24 / 16												
	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9												
	0	0	0	0	0	0	0	0	0	0	0	0
16 / 9												
	0	0	0	0	0	0	0	0	0	0	0	0
MIT	20.3669	20.5037	20.6834	20.8622	20.9421	20.9592	20.9603	20.9603	20.9515	20.8300	20.5577	20.3474 (87)
Th 2	20.2253	20.2282	20.2310	20.2454	20.2483	20.2627	20.2627	20.2655	20.2569	20.2483	20.2425	20.2368 (88)
util rest of house												
	0.9970	0.9885	0.9562	0.8420	0.6409	0.4302	0.2912	0.3291	0.5760	0.9037	0.9903	0.9980 (89)
Tweekday												
	19.3661	19.5692	19.8268	20.0809	20.1735	20.2037	20.2045	20.2075	20.1926	20.0458	19.6667	19.3472
Tweekend												
	19.3661	19.5692	19.8268	20.0809	20.1735	20.2037	20.2045	20.2075	20.1926	20.0458	19.6667	19.3472
MIT 2	19.3661	19.5692	19.8268	20.0809	20.1735	20.2037	20.2045	20.2075	20.1926	20.0458	19.6667	19.3472 (90)
Living area fraction												
	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513	0.1513 (91)
MIT	19.5175	19.7106	19.9564	20.1991	20.2899	20.3180	20.3189	20.3215	20.3075	20.1645	19.8015	19.4985 (92)
Temperature adjustment												
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (93)
adjusted MIT												
	19.5175	19.7106	19.9564	20.1991	20.2899	20.3180	20.3189	20.3215	20.3075	20.1645	19.8015	19.4985 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9961	0.9862	0.9521	0.8400	0.6437	0.4344	0.2956	0.3339	0.5805	0.9005	0.9883	0.9974 (94)
Useful gains	712.7086	864.7355	976.6780	981.2887	810.4476	538.7415	350.9855	368.4791	584.3219	771.4623	713.9611	666.8246 (95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W												
	1515.0218	1468.6286	1328.9993	1093.5002	827.8938	539.7509	351.0430	368.6075	590.8839	921.8317	1234.2686	1498.7839 (97)
Month fracti	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000 (97a)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF DWELLING EMISSIONS FOR REGULATIONS COMPLIANCE 09 Jan 2014

Space heating kWh	596.9210	405.8162	262.1271	80.7923	12.9800	0.0000	0.0000	0.0000	0.0000	111.8748	374.6214	618.9777 (98)
Space heating												2464.1105 (98)
Space heating per m2												(98) / (4) = 20.6029 (99)

8c. Space cooling requirement

Not applicable

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												280.9127 (206)
Efficiency of secondary/supplementary heating system, %												100.0000 (208)
Space heating requirement												877.1802 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	596.9210	405.8162	262.1271	80.7923	12.9800	0.0000	0.0000	0.0000	0.0000	111.8748	374.6214	618.9777 (98)
Space heating efficiency (main heating system 1)	280.9127	280.9127	280.9127	280.9127	280.9127	0.0000	0.0000	0.0000	0.0000	280.9127	280.9127	280.9127 (210)
Space heating fuel (main heating system)	212.4935	144.4635	93.3127	28.7606	4.6206	0.0000	0.0000	0.0000	0.0000	39.8255	133.3587	220.3452 (211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	210.0117	184.9182	193.7648	173.0869	169.1775	150.5312	143.9650	158.8071	158.7876	179.5111	190.5820	204.7530 (64)
Efficiency of water heater	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100 (216)
(217)m	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100	442.5100 (217)
Fuel for water heating, kWh/month	47.4592	41.7885	43.7877	39.1148	38.2313	34.0176	32.5337	35.8878	35.8834	40.5666	43.0684	46.2708 (219)
Water heating fuel used												478.6097 (219)
Annual totals kWh/year												
Space heating fuel - main system												877.1802 (211)
Space heating fuel - secondary												0.0000 (215)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, Database: in-use factor = 1.2500, SFP = 0.8750)												
mechanical ventilation fans (SFP = 0.8750)												370.3798 (230a)
Total electricity for the above, kWh/year												370.3798 (231)
Electricity for lighting (calculated in Appendix L)												453.3724 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV Unit 0 (0.80 * 3.12 * 951 * 1.00) =												-2372.7375 (233)
Total delivered energy for all uses												-193.1953 (238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	877.1802	0.5190	455.2565 (261)
Space heating - secondary	0.0000	0.5190	0.0000 (263)
Water heating (other fuel)	478.6097	0.5190	248.3985 (264)
Space and water heating			703.6550 (265)
Pumps and fans	370.3798	0.5190	192.2271 (267)
Energy for lighting	453.3724	0.5190	235.3003 (268)
Energy saving/generation technologies			
PV Unit	-2372.7375	0.5190	-1231.4508 (269)
Total CO2, kg/year			-100.2684 (272)
Dwelling Carbon Dioxide Emission Rate (DER)			-0.8400 (273)

16 CO2 EMISSIONS ASSOCIATED WITH APPLIANCES AND COOKING AND SITE-WIDE ELECTRICITY GENERATION TECHNOLOGIES

DER			-0.8400 ZC1
Total Floor Area		TFA	119.6000
Assumed number of occupants		N	2.8618
CO2 emission factor in Table 12 for electricity displaced from grid		EF	0.5190
CO2 emissions from appliances, equation (L14)			14.1055 ZC2
CO2 emissions from cooking, equation (L16)			1.5692 ZC3
Total CO2 emissions			14.8348 ZC4
Residual CO2 emissions offset from biofuel CHP			0.0000 ZC5
Additional allowable electricity generation, kWh/m²/year			0.0000 ZC6
Resulting CO2 emissions offset from additional allowable electricity generation			0.0000 ZC7
Net CO2 emissions			14.8348 ZC8

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

SAP 2012 WORKSHEET FOR New Build (As Designed) (Version 9.92, January 2014)
CALCULATION OF TARGET EMISSIONS 09 Jan 2014

1. Overall dwelling dimensions

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.2000 (1b)	x 2.8000 (2b)	= 165.7600 (1b) - (3b)
First floor	60.4000 (1c)	x 3.0000 (2c)	= 181.2000 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	119.6000		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	346.9600 (5)

2. Ventilation rate

	main heating	secondary heating	other	total	m3 per hour							
Number of chimneys	0	+	0	=	0 * 40 = 0.0000 (6a)							
Number of open flues	0	+	0	=	0 * 20 = 0.0000 (6b)							
Number of intermittent fans					4 * 10 = 40.0000 (7a)							
Number of passive vents					0 * 10 = 0.0000 (7b)							
Number of flueless gas fires					0 * 40 = 0.0000 (7c)							
					Air changes per hour							
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(7a)+(7b)+(7c) =				40.0000 / (5) = 0.1153 (8)							
Pressure test					Yes							
Measured/design AP50					5.0000							
Infiltration rate					0.3653 (18)							
Number of sides sheltered					1 (19)							
Shelter factor	(20) = 1 - [0.075 x (19)] =				0.9250 (20)							
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =				0.3379 (21)							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.4308	0.4224	0.4139	0.3717	0.3632	0.3210	0.3210	0.3125	0.3379	0.3632	0.3801	0.3970 (22b)
Effective ac	0.5928	0.5892	0.5857	0.5691	0.5660	0.5515	0.5515	0.5488	0.5571	0.5660	0.5722	0.5788 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K					
TER Opaque door			2.4000	1.0000	2.4000		(26)					
TER Opening Type (Uw = 1.40)			26.3200	1.3258	34.8939		(27)					
Heat Loss Floor 1			59.2000	0.1300	7.6960		(28a)					
External Wall 1	128.7000	28.7200	99.9800	0.1800	17.9964		(29a)					
External Roof 1	60.4000		60.4000	0.1300	7.8520		(30)					
Total net area of external elements Aum(A, m2)			248.3000				(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	70.8383		(33)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							250.0000 (35)					
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							13.2580 (36)					
Total fabric heat loss						(33) + (36) =	84.0963 (37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 67.8736	Feb 67.4610	Mar 67.0566	Apr 65.1570	May 64.8016	Jun 63.1472	Jul 63.1472	Aug 62.8408	Sep 63.7845	Oct 64.8016	Nov 65.5206	Dec 66.2722 (38)
Heat transfer coeff	151.9699	151.5573	151.1529	149.2534	148.8980	147.2435	147.2435	146.9371	147.8808	148.8980	149.6169	150.3686 (39)
Average = Sum(39)m / 12 =												149.2517 (39)
HLP	Jan 1.2707	Feb 1.2672	Mar 1.2638	Apr 1.2479	May 1.2450	Jun 1.2311	Jul 1.2311	Aug 1.2286	Sep 1.2365	Oct 1.2450	Nov 1.2510	Dec 1.2573 (40)
HLP (average)												1.2479 (40)
Days in month	31	28	31	30	31	30	31	31	30	31	30	31 (41)

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.8618 (42)
Average daily hot water use (litres/day)												102.1667 (43)
Daily hot water use	Jan 112.3834	Feb 108.2967	Mar 104.2100	Apr 100.1234	May 96.0367	Jun 91.9500	Jul 91.9500	Aug 96.0367	Sep 100.1234	Oct 104.2100	Nov 108.2967	Dec 112.3834 (44)
Energy conte	166.6613	145.7630	150.4144	131.1349	125.8271	108.5792	100.6146	115.4567	116.8356	136.1607	148.6300	161.4026 (45)
Energy content (annual)										Total = Sum(45)m =		1607.4800 (45)
Distribution loss (46)m = 0.15 x (45)m												
	24.9992	21.8645	22.5622	19.6702	18.8741	16.2869	15.0922	17.3185	17.5253	20.4241	22.2945	24.2104 (46)
Water storage loss:												
Store volume												210.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7016 (48)
Temperature factor from Table 2b												0.5400 (49)

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

Enter (49) or (54) in (55)	0.9188 (55)											
Total storage loss	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (56)
If cylinder contains dedicated solar storage	28.4842	25.7277	28.4842	27.5653	28.4842	27.5653	28.4842	28.4842	27.5653	28.4842	27.5653	28.4842 (57)
Primary loss	23.2624	21.0112	23.2624	22.5120	23.2624	22.5120	23.2624	23.2624	22.5120	23.2624	22.5120	23.2624 (59)
Total heat required for water heating calculated for each month	218.4079	192.5019	202.1610	181.2123	177.5737	158.6565	152.3612	167.2033	166.9130	187.9072	198.7073	213.1491 (62)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63)
Output from w/h	218.4079	192.5019	202.1610	181.2123	177.5737	158.6565	152.3612	167.2033	166.9130	187.9072	198.7073	213.1491 (64)
Heat gains from water heating, kWh/month	96.8122	85.8573	91.4101	83.6642	83.2348	76.1645	74.8516	79.7866	78.9097	86.6707	89.4814	95.0636 (65)

5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	143.0878	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	25.3890	22.5502	18.3391	13.8839	10.3784	8.7618	9.4675	12.3062	16.5173	20.9726	24.4781	26.0946	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	284.6915	287.6457	280.2012	264.3528	244.3469	225.5442	212.9829	210.0287	217.4732	233.3216	253.3275	272.1302	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	37.3088	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	-114.4702	(71)
Water heating gains (Table 5)	130.1239	127.7638	122.8630	116.2003	111.8747	105.7840	100.6070	107.2401	109.5968	116.4929	124.2797	127.7737	(72)
Total internal gains	509.1307	506.8861	490.3296	463.3633	435.5263	409.0164	391.9837	398.5013	412.5137	439.7134	471.0116	494.9248	(73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d		Gains W	
North					7.8800	10.6334		0.6300	0.7000	0.7700		25.6077 (74)	
South					9.4600	46.7521		0.6300	0.7000	0.7700		135.1648 (78)	
West					8.9800	19.6403		0.6300	0.7000	0.7700		53.9008 (80)	

Solar gains	214.6733	375.7442	538.7839	705.5237	822.4085	829.9490	794.5950	705.7682	596.5016	422.1321	259.0148	182.4681 (83)	
Total gains	723.8040	882.6303	1029.1135	1168.8870	1257.9348	1238.9653	1186.5787	1104.2694	1009.0153	861.8455	730.0264	677.3929 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	54.6526	54.8014	54.9480	55.6474	55.7802	56.4069	56.4069	56.5245	56.1639	55.7802	55.5121	55.2346
alpha	4.6435	4.6534	4.6632	4.7098	4.7187	4.7605	4.7605	4.7683	4.7443	4.7187	4.7008	4.6823
util living area	0.9979	0.9944	0.9842	0.9504	0.8623	0.6982	0.5317	0.5878	0.8305	0.9711	0.9953	0.9985 (86)
MIT	19.6049	19.7988	20.0931	20.4638	20.7684	20.9402	20.9868	20.9792	20.8590	20.4507	19.9567	19.5752 (87)
Th 2	19.8639	19.8666	19.8693	19.8818	19.8842	19.8952	19.8952	19.8972	19.8909	19.8842	19.8794	19.8745 (88)
util rest of house	0.9972	0.9924	0.9784	0.9317	0.8118	0.6017	0.4055	0.4588	0.7521	0.9566	0.9933	0.9979 (89)
MIT 2	18.0143	18.2987	18.7269	19.2604	19.6610	19.8564	19.8905	19.8890	19.7805	19.2534	18.5390	17.9782 (90)
Living area fraction									fLA = Living area / (4) =			0.1513 (91)
MIT	18.2550	18.5257	18.9336	19.4425	19.8286	20.0204	20.0565	20.0540	19.9438	19.4346	18.7536	18.2199 (92)
Temperature adjustment												0.0000
adjusted MIT	18.2550	18.5257	18.9336	19.4425	19.8286	20.0204	20.0565	20.0540	19.9438	19.4346	18.7536	18.2199 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Useful gains	0.9955	0.9889	0.9718	0.9224	0.8088	0.6135	0.4245	0.4781	0.7565	0.9485	0.9902	0.9967	(94)
Ext temp.	720.5575	872.8727	1000.0787	1078.1448	1017.4759	760.0965	503.7332	527.9077	763.2701	817.4854	722.8911	675.1307	(95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Month fracti	2120.7473	2065.0763	1879.3796	1573.5030	1210.3267	798.1162	508.9404	536.9068	864.1799	1315.4498	1743.5700	2108.1527	(97)
Space heating kWh	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	1.0000	1.0000	1.0000	(97a)
Space heating	1041.7412	801.1608	654.1999	356.6579	143.4810	0.0000	0.0000	0.0000	0.0000	370.4855	734.8888	1066.1684	(98)
Space heating per m2													(98) / (4) =

8c. Space cooling requirement

Not applicable

FULL SAP CALCULATION PRINTOUT

Calculation Type: New Build (As Designed)

CALCULATION OF TARGET EMISSIONS 09 Jan 2014

9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000 (201)
Fraction of space heat from main system(s)													1.0000 (202)
Efficiency of main space heating system 1 (in %)													93.5000 (206)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
Space heating requirement													5528.1106 (211)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1041.7412	801.1608	654.1999	356.6579	143.4810	0.0000	0.0000	0.0000	0.0000	370.4855	734.8888	1066.1684	(98)
Space heating efficiency (main heating system 1)	93.5000	93.5000	93.5000	93.5000	93.5000	0.0000	0.0000	0.0000	0.0000	93.5000	93.5000	93.5000	(210)
Space heating fuel (main heating system)	1114.1617	856.8565	699.6790	381.4523	153.4556	0.0000	0.0000	0.0000	0.0000	396.2412	785.9773	1140.2870	(211)
Water heating requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	218.4079	192.5019	202.1610	181.2123	177.5737	158.6565	152.3612	167.2033	166.9130	187.9072	198.7073	213.1491	(64)
Efficiency of water heater (217)m	88.4446	88.2087	87.7233	86.5884	84.2517	79.8000	79.8000	79.8000	79.8000	86.5928	87.9889	88.5224	(216)
Fuel for water heating, kWh/month	246.9432	218.2347	230.4531	209.2800	210.7656	198.8177	190.9288	209.5279	209.1641	217.0010	225.8323	240.7856	(219)
Water heating fuel used												2607.7339	(219)
Annual totals kWh/year													
Space heating fuel - main system												5528.1106	(211)
Space heating fuel - secondary												0.0000	(215)
Electricity for pumps and fans:													
central heating pump												30.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												75.0000	(231)
Electricity for lighting (calculated in Appendix L)												448.3769	(232)
Total delivered energy for all uses												8659.2214	(238)

12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	5528.1106	0.2160	1194.0719 (261)
Space heating - secondary	0.0000	0.0000	0.0000 (263)
Water heating (other fuel)	2607.7339	0.2160	563.2705 (264)
Space and water heating			1757.3424 (265)
Pumps and fans	75.0000	0.5190	38.9250 (267)
Energy for lighting	448.3769	0.5190	232.7076 (268)
Total CO2, kg/m2/year			2028.9750 (272)
Emissions per m2 for space and water heating			14.6935 (272a)
Fuel factor (electricity)			1.5500
Emissions per m2 for lighting			1.9457 (272b)
Emissions per m2 for pumps and fans			0.3255 (272c)
Target Carbon Dioxide Emission Rate (TER) = (14.6935 * 1.55) + 1.9457 + 0.3255, rounded to 2 d.p.			25.0500 (273)

Appendix 3



SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	Unit 02 - GF	Issued on Date	22/09/2022
Assessment Reference	001	Prop Type Ref	
Property			

SAP Rating	89 B	DER	-4.06	TER	30.07
Environmental	105 A	% DER<TER	113.50		
CO ₂ Emissions (t/year)	-0.53	DFEE	43.00	TFEE	58.90
General Requirements Compliance	Pass	% DFEE<TFEE	26.99		

Assessor Details	Mr. Edward Coate, Edward Coate, Tel: 07427310051, ed.coate@nrgconsulting.org	Assessor ID	Z417-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South
Property Tenure	Owner-occupied
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	Flat, Mid-Terrace
2.0 Number of Storeys	1
3.0 Date Built	2022
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	29.50 m	68.00 m ²	2.80 m

7.0 Living Area	30.20	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls		U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type			
External Wall 1	Cavity Wall	0.16	48.16	37.98
External Wall 2	Cavity Wall	0.17	34.44	34.44

11.0 Heat Loss Floors		U-Value (W/m ² K)	Area (m ²)
Description	Type		
Heat Loss Floor 1	Ground Floor - Solid	0.09	68.00

12.0 Opening Types									
Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Opening Type 1	SAP table	Door to Corridor							1.40
Opening Type 2	Manufacture r	Window	Triple Low-E Hard 0.2			0.64		0.70	0.97
Opening Type 3	Manufacture r	Solid Door							1.14

13.0 Openings

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Solid Door	[1] External Wall 1	South							2.40	
Opening 2	Window	[1] External Wall 1	South	None	0.00					2.31	
Opening 3	Window	[1] External Wall 1	North	None	0.00					3.24	
Opening 4	Window	[1] External Wall 1	North	None	0.00					2.23	

14.0 Conservatory

15.0 Draught Proofing

 %

16.0 Draught Lobby

17.0 Thermal Bridging

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	5.10	0.018	No	0.018
Independently assessed	E3 Sill	4.10	0.019	No	0.019
Independently assessed	E4 Jamb	16.20	0.015	No	0.015
Independently assessed	E5 Ground floor (normal)	17.40	0.097	No	0.097
Independently assessed	E5 Ground floor (normal)	12.30	0.230	No	
Independently assessed	E7 Party floor between dwellings (in blocks of flats)	17.40	0.033	No	0.033
Independently assessed	E7 Party floor between dwellings (in blocks of flats)	12.30	0.101	No	
Independently assessed	E16 Corner (normal)	2.80	0.051	No	0.051
Independently assessed	E16 Corner (normal)	11.20	0.130	No	
Independently assessed	E18 Party wall between dwellings	2.80	0.032	No	0.032
Table K1 - Default	P1 Party wall - Ground floor	5.60	0.160	No	
Table K1 - Default	P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	5.60	0.000	No	

Y-value W/m²K

18.0 Pressure Testing

Designed AP₅₀ m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather

Cross ventilation possible

Night Ventilation

Air change rate

Mechanical Ventilation

Mechanical Ventilation System Present

Approved Installation

Mechanical Ventilation data Type

Type

MV Reference Number

Configuration

MVHR Duct Insulated

Manufacturer SFP

Duct Type

MVHR Efficiency

Wet Rooms

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	1	
Total number of L.E.L. fittings	1	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Percentage of Heat	100	%
Database Ref. No.	100834	
Fuel Type	Electricity	
Main Heating	PEH	
SAP Code	524	
In Winter	0.0	
In Summer	0.0	
Controls	CWD Time and temperature zone control	
Sap Code	2506	

25.0 Main Heating 2

None

Community Heating None

28.0 Water Heating

	HWP From main heating 1	
Water Heating	Main Heating 1	
Flue Gas Heat Recovery System	No	
Waste Water Heat Recovery Instantaneous System 1	No	
Waste Water Heat Recovery Instantaneous System 2	No	
Waste Water Heat Recovery Storage System	No	
Solar Panel	No	
Water use <= 125 litres/person/day	Yes	
SAP Code	901	
Immersion Only Heating Hot Water	No	

29.0 Hot Water Cylinder

	Internal Store	
Insulation Type	Measured Loss	
Cylinder Volume	180.00	L

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Loss kWh/day

32.0 Photovoltaic Unit

PV Cells kWp

3.12

Orientation

Horizontal

Elevation

Horizontal

Overshading

None Or Little

Connected to Dwelling

No

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	Unit 17 - GF	Issued on Date	22/09/2022
Assessment Reference	001	Prop Type Ref	
Property			

SAP Rating	91 B	DER	-0.84	TER	25.05
Environmental	102 A	% DER<TER	103.35		
CO ₂ Emissions (t/year)	-0.40	DFEE	39.79	TFEE	57.53
General Requirements Compliance	Pass	% DFEE<TFEE	30.84		

Assessor Details	Mr. Edward Coate, Edward Coate, Tel: 07427310051, ed.coate@nrgconsulting.org	Assessor ID	Z417-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	North
Property Tenure	Owner-occupied
Transaction Type	New dwelling
Terrain Type	Urban
1.0 Property Type	House, Semi-Detached
2.0 Number of Storeys	2
3.0 Date Built	2022
4.0 Sheltered Sides	1
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	22.50 m	59.20 m ²	2.80 m
	1st Storey:	21.90 m	60.40 m ²	3.00 m

7.0 Living Area	18.10	m ²
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8.0 Thermal Mass Parameter	Simple calculation - Medium	
Thermal Mass	250.00	kJ/m ² K

9.0 External Walls		U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type			
External Wall 1	Cavity Wall	0.16	128.70	99.98

10.0 External Roofs		U-Value (W/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Description	Type			
External Roof 1	External Flat Roof	0.12	60.40	60.40

11.0 Heat Loss Floors		U-Value (W/m ² K)	Area (m ²)
Description	Type		
Heat Loss Floor 1	Ground Floor - Solid	0.09	59.20

12.0 Opening Types		Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
Opening Type 1	Manufacture	Solid Door								1.14
Opening Type 2	Manufacture	Window		Triple Low-E Hard 0.2			0.64		0.70	0.97

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
Opening 1	Solid Door	[1] External Wall 1	North							2.40	
Opening 2	Window	[1] External Wall 1	North	None	0.00					1.20	
Opening 3	Window	[1] External Wall 1	North	None	0.00					6.68	
Opening 4	Window	[1] External Wall 1	West	None	0.00					4.32	
Opening 5	Window	[1] External Wall 1	West	None	0.00					2.23	
Opening 6	Window	[1] External Wall 1	South	None	0.00					4.32	
Opening 7	Window	[1] External Wall 1	South	None	0.00					0.68	
Opening 8	Window	[1] External Wall 1	West	None	0.00					2.43	
Opening 9	Window	[1] External Wall 1	South	None	0.00					4.46	

14.0 Conservatory

None

15.0 Draught Proofing

100 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	15.50	0.018	No	0.018
Independently assessed	E3 Sill	14.50	0.019	No	0.019
Independently assessed	E4 Jamb	49.80	0.015	No	0.015
Independently assessed	E5 Ground floor (normal)	22.60	0.097	No	0.097
Independently assessed	E6 Intermediate floor within a dwelling	21.90	0.000	No	0
Table K1 - Default	E14 Flat roof	21.90	0.080	No	
Independently assessed	E16 Corner (normal)	14.40	0.051	No	0.051
Independently assessed	E17 Corner (inverted – internal area greater than external area)	2.80	-0.079	No	-0.079
Independently assessed	E18 Party wall between dwellings	11.60	0.032	No	0.032
Table K1 - Default	P1 Party wall - Ground floor	10.50	0.160	No	
Table K1 - Default	P2 Party wall - Intermediate floor within a dwelling	11.00	0.000	No	
Table K1 - Default	P4 Party wall - Roof (insulation at ceiling level)	11.00	0.240	No	

Y-value 0.042 W/m²K

18.0 Pressure Testing

Yes

Designed AP₅₀ 3.00 m³/(h.m²) @ 50 Pa

Property Tested ?

As Built AP₅₀ m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather Windows fully open

Cross ventilation possible Yes

Night Ventilation Yes

Air change rate 6.00

Mechanical Ventilation

Mechanical Ventilation System Present Yes

Approved Installation Yes

Mechanical Ventilation data Type Database

Type Balanced mechanical ventilation with heat recovery

MV Reference Number 500352

Configuration 2

MVHR Duct Insulated Yes

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Manufacturer SFP	0.70
Duct Type	Rigid
MVHR Efficiency	91.00
Wet Rooms	2

20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				0
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System

No

22.0 Lighting

Internal

Total number of light fittings	1	
Total number of L.E.L. fittings	1	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted No

23.0 Electricity Tariff

Standard

24.0 Main Heating 1

	Database	
Percentage of Heat	100	%
Database Ref. No.	104369	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	0.0	
In Summer	0.0	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	<= 35°C	

25.0 Main Heating 2

None

Community Heating None

28.0 Water Heating

	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
Immersion Only Heating Hot Water	No			
29.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	210.00			
Loss	1.20			
Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
3.12	Horizontal	Horizontal	None Or Little	No
Recommendations				
Lower cost measures				
None				
Further measures to achieve even higher standards				
None				

Appendix 4



MAXEON® 2 | 360 W

Commercial Solar Panel

SunPower Maxeon panels combine high efficiency with the strongest durability and warranty available in the market today, resulting in more long-term energy and savings.^{1,2}



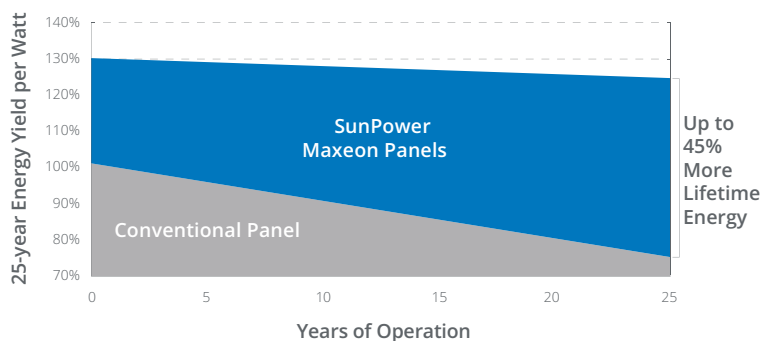
High Efficiency

Generates more power and savings per available space, making it easier to meet your organization's goals.



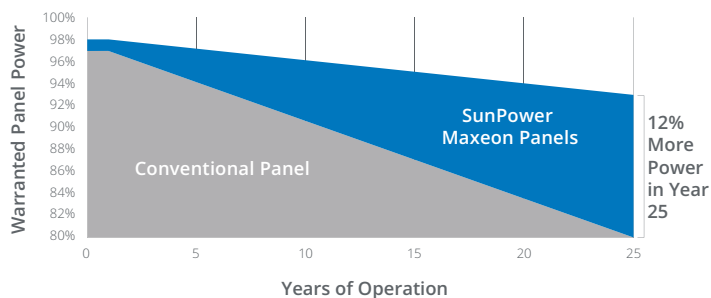
More Lifetime Energy and Savings

Designed to deliver 40% more energy in the same space over 25 years in real-world conditions like partial shade and high temperatures.²



Better Reliability, Better Warranty

With more than 25 million panels deployed around the world, SunPower technology is proven to last. That's why we stand behind our panel with an exceptional 25-year Combined Power and Product Warranty, including the highest Power Warranty in solar.



Fundamentally Different. And Better.



The SunPower Maxeon® Solar Cell

- Enables high efficiency panels²
- Unmatched reliability³
- Patented solid metal foundation prevents breakage and corrosion



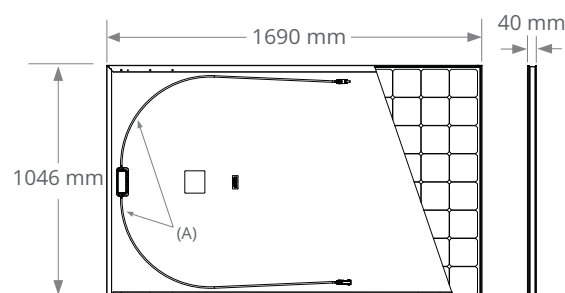
As Sustainable As Its Energy

- Ranked #1 in Silicon Valley Toxics Coalition Solar Scorecard⁴
- First solar panels to achieve Cradle to Cradle Certified™ Silver recognition⁵ (pending)
- Contributes to more LEED categories than conventional panels⁶

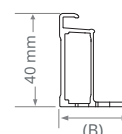
Electrical Data			
	SPR-MAX2-360-COM	SPR-MAX2-350-COM	SPR-MAX2-340-COM
Nominal Power (P _{nom}) ⁷	360 W	350 W	340 W
Power Tolerance	+5/0%	+5/0%	+5/0%
Panel Efficiency	20.4%	19.8%	19.2%
Rated Voltage (V _{mpp})	59.1 V	57.9 V	56.6 V
Rated Current (I _{mpp})	6.09 A	6.05 A	6.00 A
Open-Circuit Voltage (V _{oc})	70.6 V	70.3 V	70.0 V
Short-Circuit Current (I _{sc})	6.50 A	6.48 A	6.46 A
Max. System Voltage	1000 V IEC		
Maximum Series Fuse	20 A		
Power Temp Coef.	-0.35% / °C		
Voltage Temp Coef.	-197.6 mV / °C		
Current Temp Coef.	2.6 mA / °C		

Tests And Certifications	
Standard Tests ⁸	IEC 61215, IEC 61730
Quality Management Certs	ISO 9001:2015, ISO 14001:2015
EHS Compliance	RoHS (Pending), OHSAS 18001:2007, lead free, REACH SVHC-163 (Pending)
Sustainability	Cradle to Cradle Certified™ (Pending)
Ammonia Test	IEC 62716
Desert Test	MIL-STD-810G
Salt Spray Test	IEC 61701 (maximum severity)
PID Test	1000 V: IEC 62804
Available Listings	TUV

Operating Condition And Mechanical Data	
Temperature	-40°C to +85°C
Impact Resistance	25 mm diameter hail at 23 m/s
Solar Cells	104 Monocrystalline Maxeon Gen II
Tempered Glass	High-transmission tempered anti-reflective
Junction Box	IP-68, Stäubli (MC4), 3 bypass diodes
Weight	19 kg
Max. Load ⁹	Wind: 2400 Pa, 244 kg/m² front & back Snow: 5400 Pa, 550 kg/m² front
Frame	Class 2 silver anodized



FRAME PROFILE



A. Cable Length: 1200 mm +/-10 mm

B. LONG SIDE: 32 mm
SHORT SIDE: 24 mm

Please read the safety and installation guide.

1 SunPower 360 W, 20.4% efficient, compared to a Conventional Panel on same-sized arrays (310 W, 16% efficient, approx. 1.6 m²), 8% more energy per watt (based on PVsyst pan files for avg EU climate), 0.5%/yr slower degradation rate (Jordan, et. al. "Robust PV Degradation Methodology and Application." PVSC 2018).

2 DNV "SunPower Shading Study," 2013. Compared to a conventional front contact panel.

3 #1 rank in "Fraunhofer PV Durability Initiative for Solar Modules: Part 3". PVTech Power Magazine, 2015.

4 SunPower is rated #1 on Silicon Valley Toxics Coalition's Solar Scorecard.

5 Cradle to Cradle Certified is a multi-attribute certification program that assesses products and materials for safety to human and environmental health, design for future use cycles, and sustainable manufacturing.

6 Maxeon2 and Maxeon3 panels additionally contribute to LEED Materials and Resources credit categories.

7 Standard Test Conditions (1000 W/m² irradiance, AM 1.5, 25° C). NREL calibration Standard: SOMS current, LACCS FF and Voltage.

8 Class C fire rating per IEC 61730.

9 Safety factor 1.5 included.

Designed in USA

Made in Malaysia (Cells)

Modules Assembled in Mexico

Visit www.sunpowercorp.co.uk for more information.

Specifications included in this datasheet are subject to change without notice.

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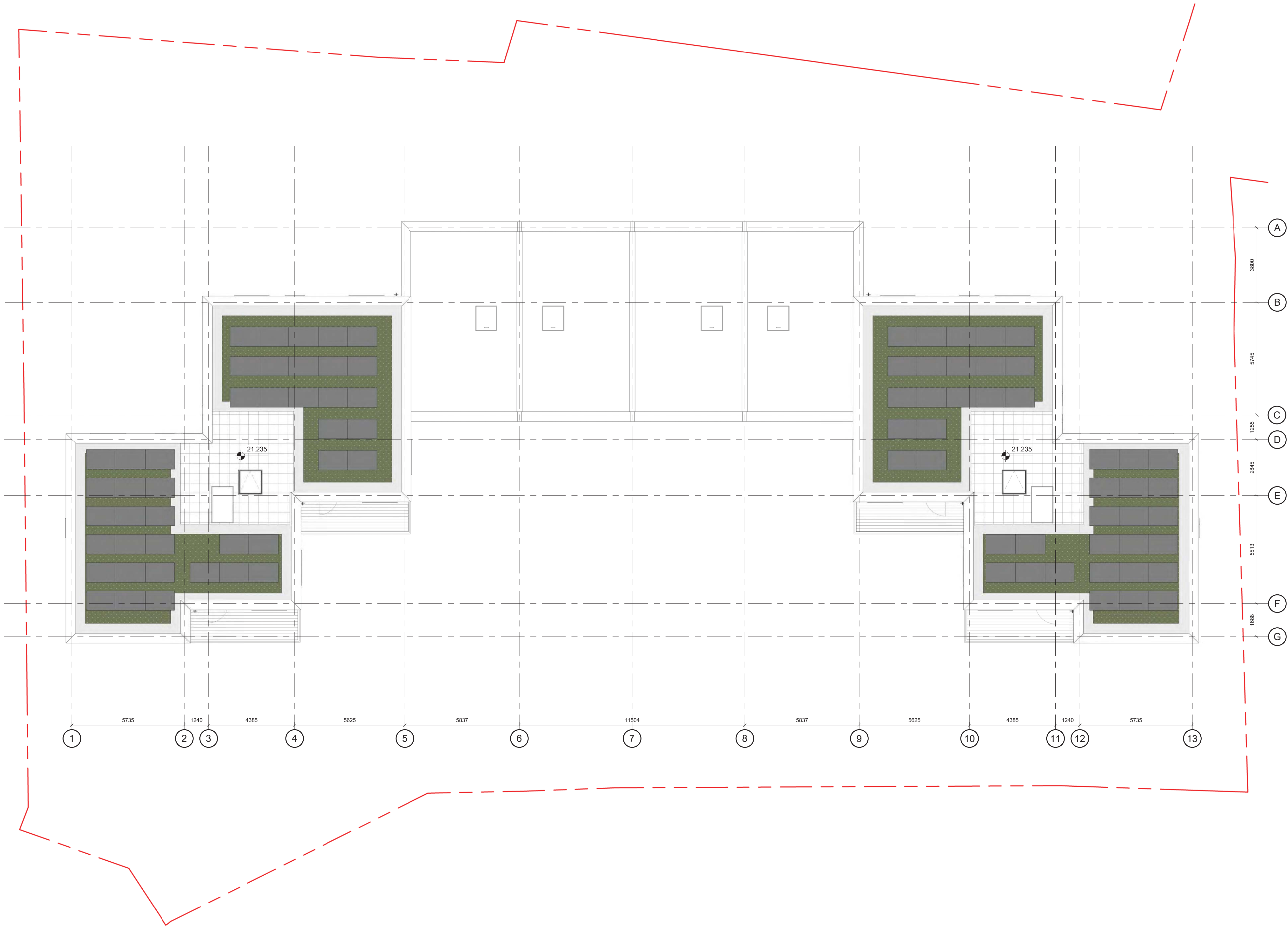
UK: 0 8082818718 | Other EU: 00 800 855 81111

SUNPOWER®

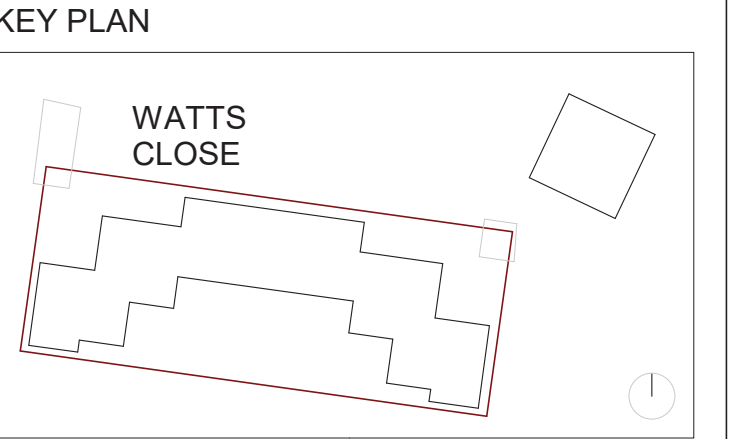
MAXEON®

532419 REV B / A4_EN

Publication Date: November 2019



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All dimensions to be checked on site before work commences.
Figured dimensions to be taken in preference to scaled dimensions.
If in doubt please ask.



P3	General update	13/09/22
P2	General update	07/09/22
P1	First Issue	23/08/22

Revision	Description	Date
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STATUS

Preliminary

PROJECT

Watts Close

DRAWING

Watts Close Proposed Roof GA Plan

DRAWN BY	CHECKED BY	DATE
RC	CB	August'22

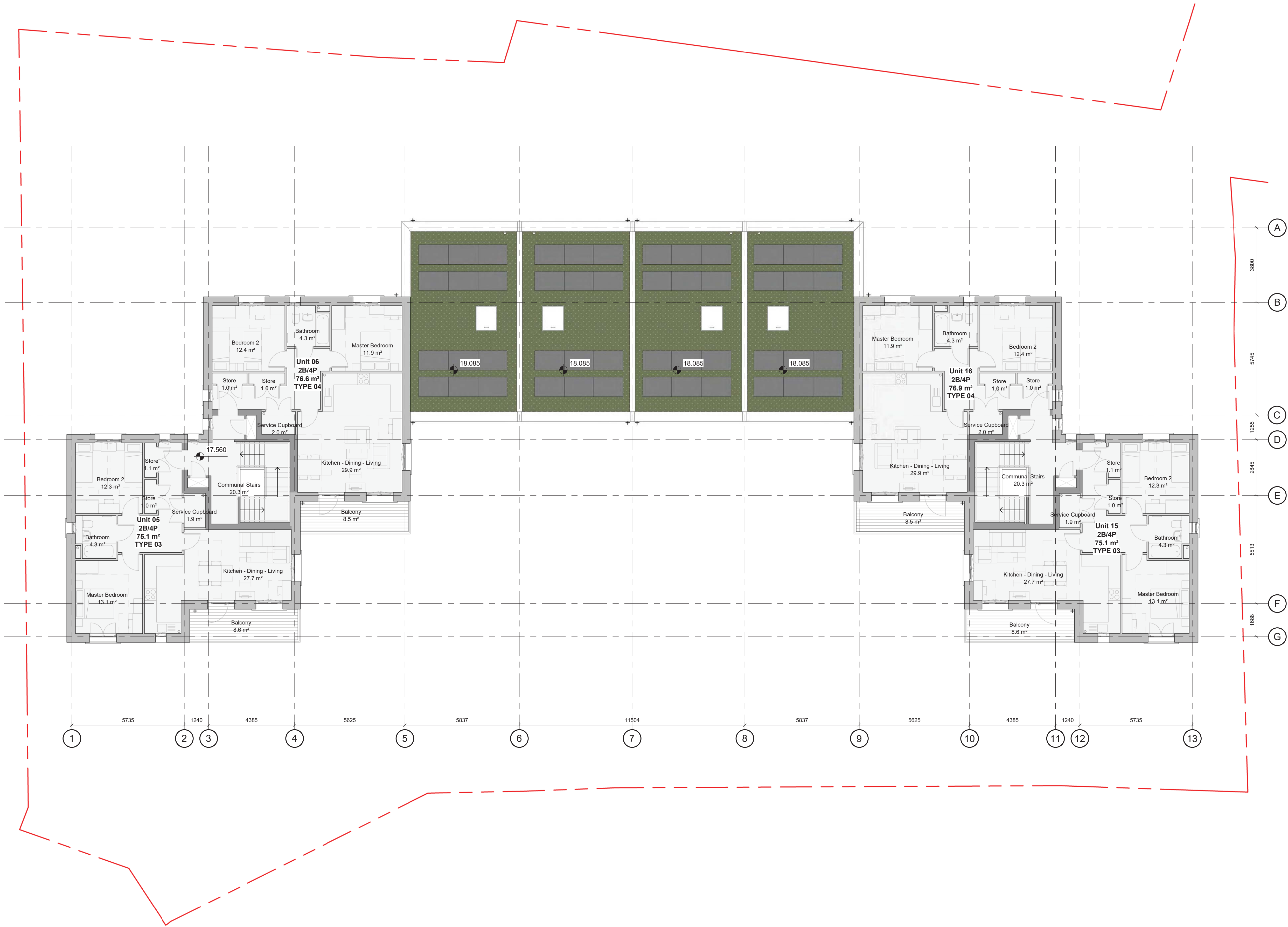
SCALE (@ A1)	PROJECT NUMBER
1 : 100	22015

DRAWING NUMBER	REV
WAT - DAR - WC - 03 - DR - A - 0113	P3

Project Identifier	Originator	Zone	Level	Type	Discipline	Number	Revision
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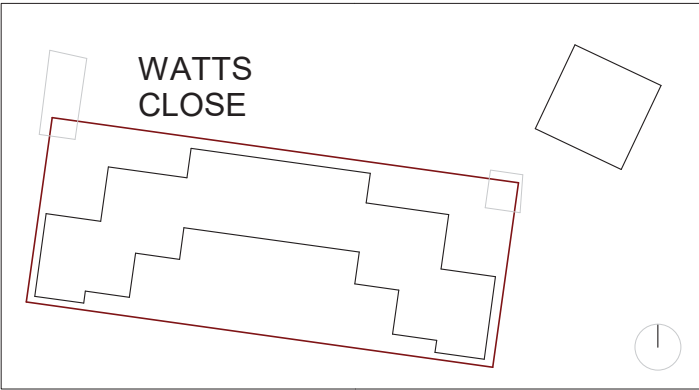
www.deltaarchitects.co.uk



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All dimensions to be checked on site before work commences.
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KEY PLAN



P3	General update	13/09/22
P2	General update	07/09/22
P1	First Issue	23/08/22

Revision	Description	Date
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STATUS

Preliminary

PROJECT

Watts Close

DRAWING

Watts Close Proposed 2nd Floor GA Plan

DRAWN BY	CHECKED BY	DATE
RC	CB	August'22

SCALE (@ A1)	PROJECT NUMBER
1 : 100	22015

DRAWING NUMBER	REV
WAT - DAR - WC - 02 - DR - A - 0112	P3

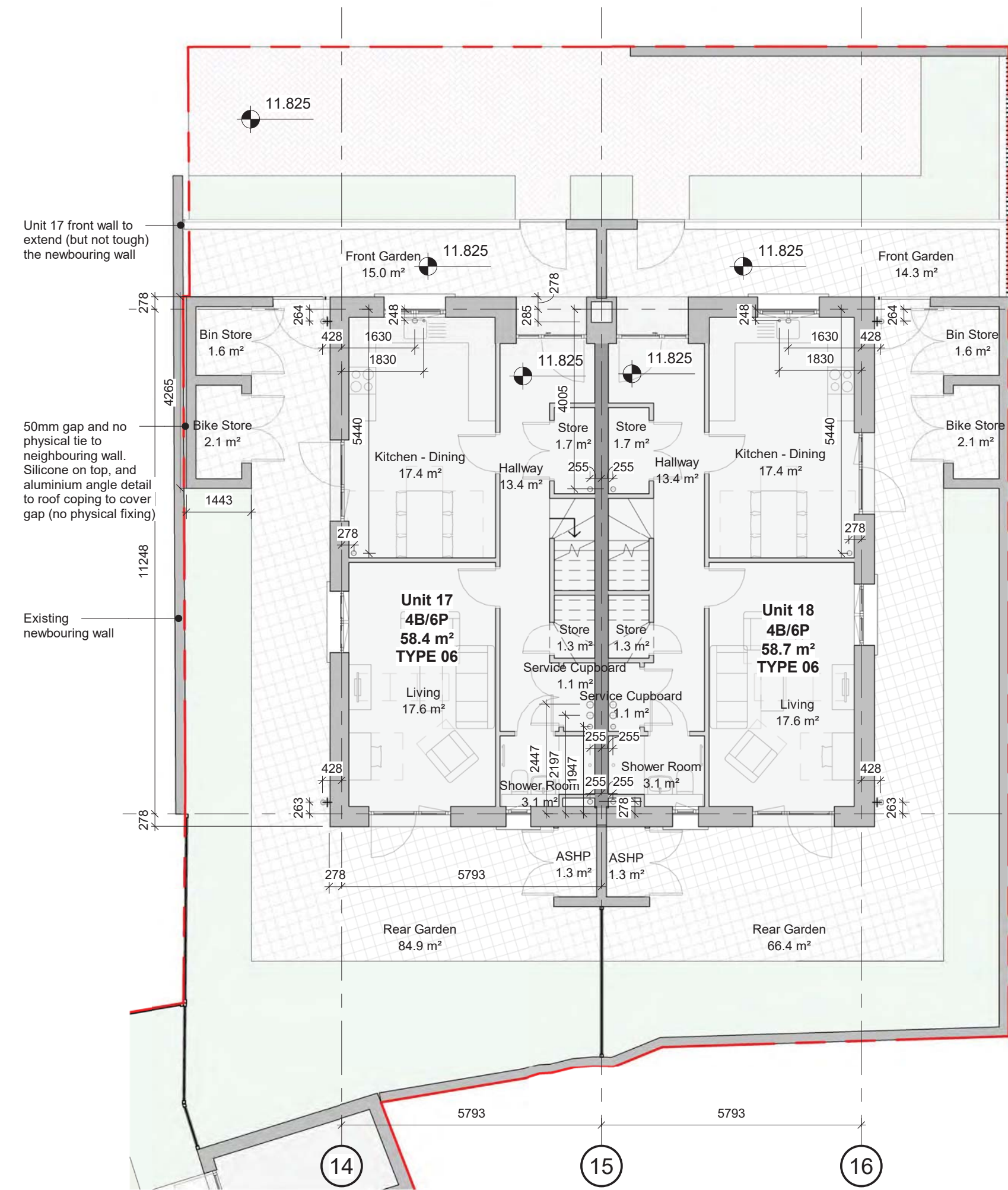
Project Identifier	Originator	Zone	Level	Type	Discipline	Number	Revision
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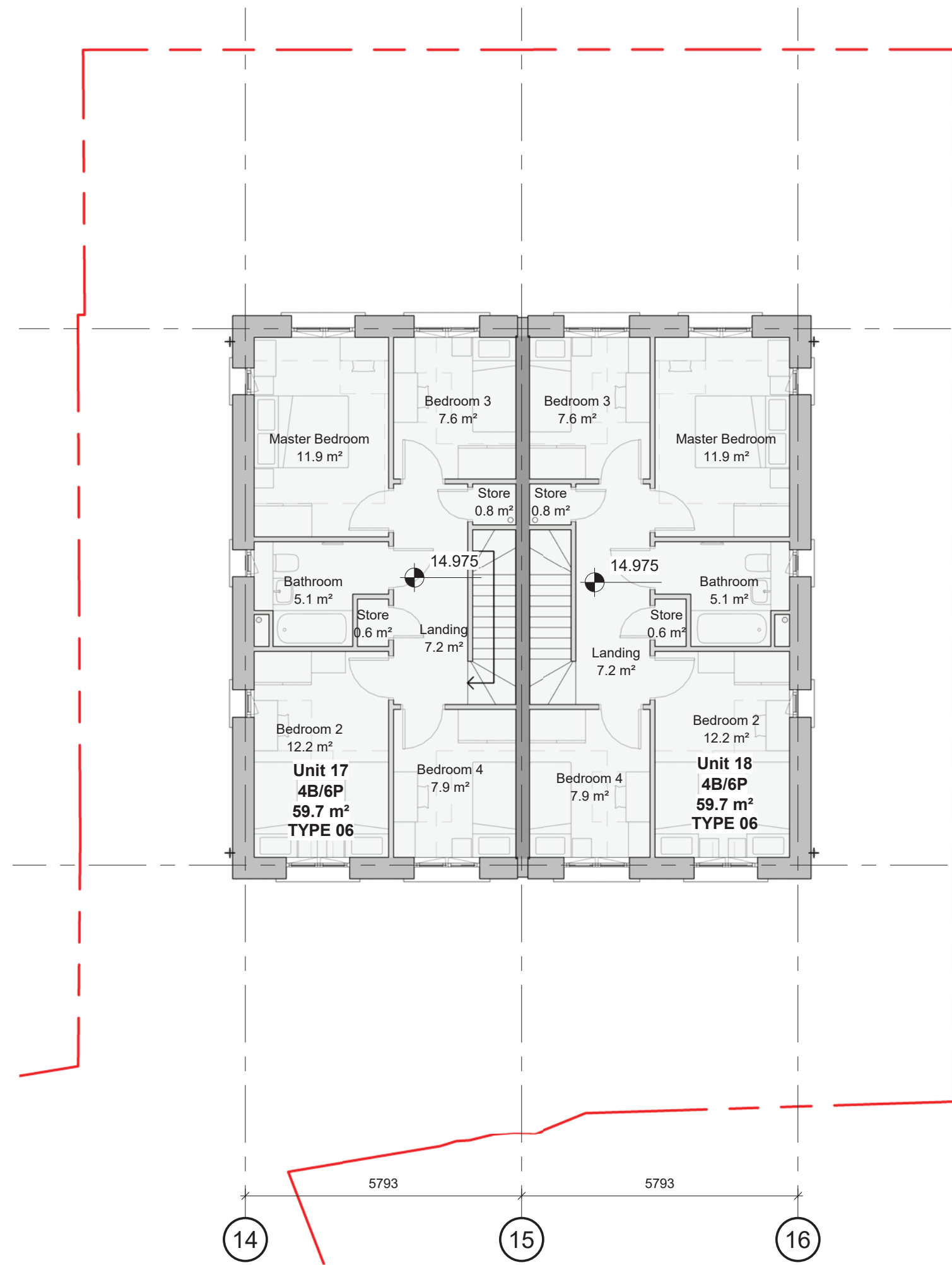
Delta Architects
1 Batemans Row
London
EC2A 3HH

T 020 7613 5702

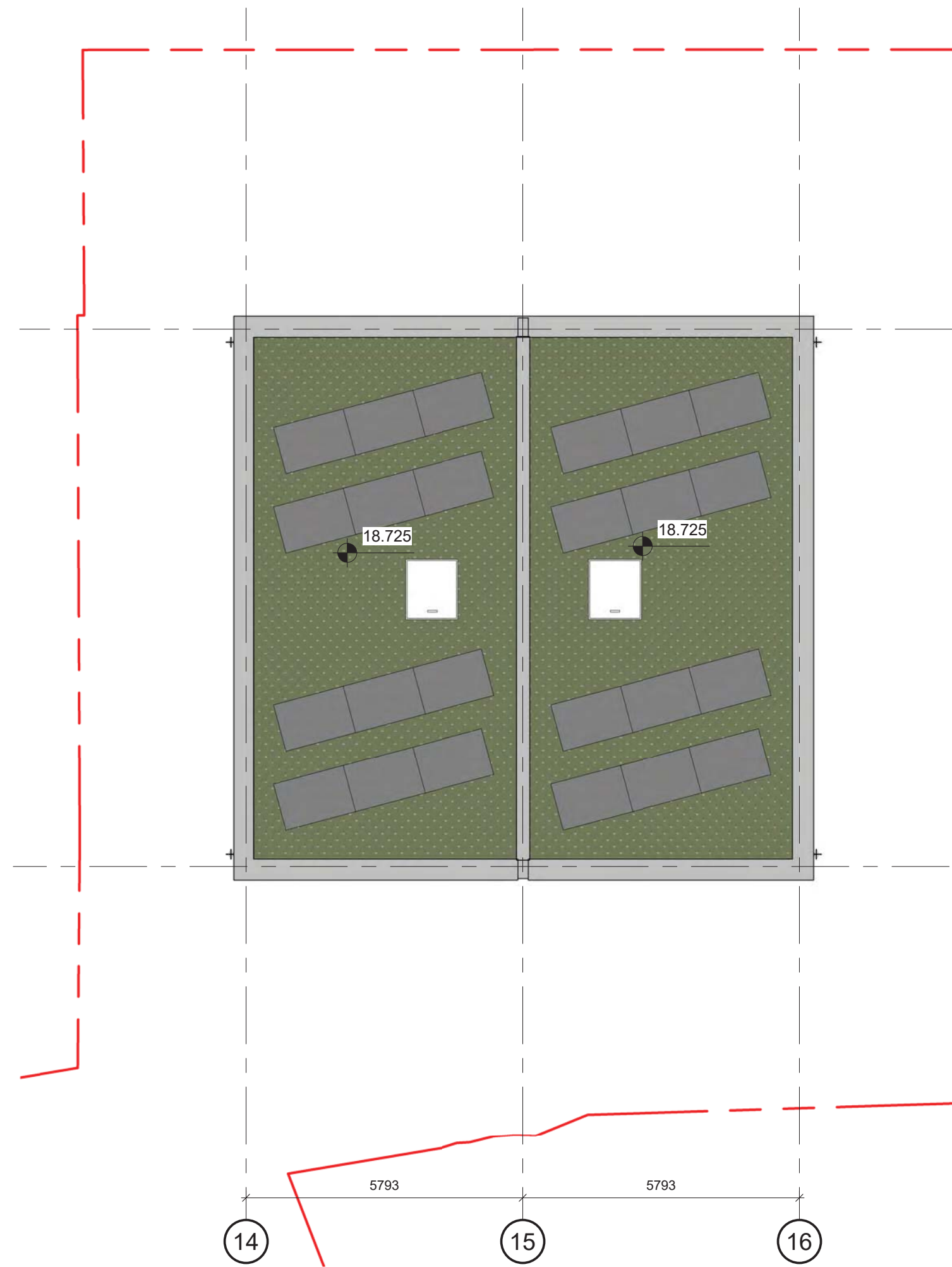
www.deltaarchitects.co.uk



1 GROUND FLOOR
1 : 100



2 FIRST FLOOR
1 : 100

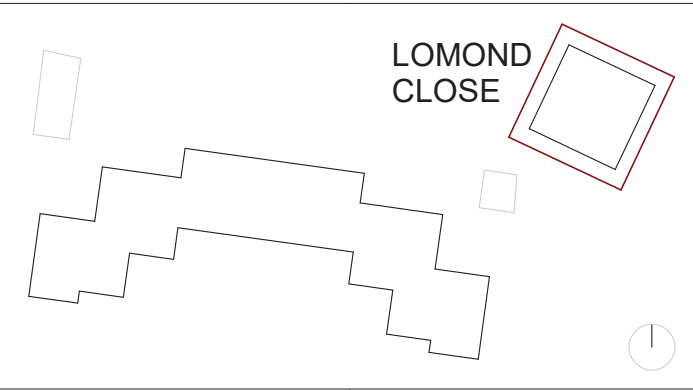


3 ROOF LEVEL
1 : 100

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KEY PLAN



P4	General update	13/09/22
P3	First issue / General update	05/09/22
P2	Revised as clouded	24/08/22
P1	First Issue	23/08/22

Revision	Description	Date
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STATUS

Preliminary

PROJECT

Watts Close

DRAWING

Lomond Close Proposed GF, 1st

Floor and Roof GA Plans

DRAWN BY

RC

CHECKED BY

CB

DATE

August'22

SCALE (@ A1)

1 : 100

PROJECT NUMBER

22015

DRAWING NUMBER

WAT - DAR - LC - XX - DR - A - 0120

REV

P4

Project Identifier

Originator

Zone

Level

Type

Discipline

Number

Revision



Delta Architects

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Appendix 5



PRODUCT DATA

COMPACT P - SERIEN BY NILAN

GO
GREEN
BY NILAN



Domestic



Passive
heat recovery



Active
heat recovery



Ventilation
< 300 m³/h



Comfort
heating



Comfort
cooling



Sanitary
hot water
production



Heating

THE VENTILATION AND HEATING SOLUTION OF THE FUTURE

Compact P is developed for future homes. The system can be used in all types of low-energy and passive buildings, but can also ensure low energy consumption in any home or flat.

Top-class efficiency

Compact P is equipped with the latest technology, comprising a highly-efficient counterflow heat exchanger, as well as a special designed heating pump that utilises the residual energy in the extracted air.

Overall, the system yields top-class performance. The counter flow heat exchanger has a temperature efficiency of up to 95%, combined with a heat pump that ensures a high supply air temperature and very low costs to production of sanitary hot water.

The integrated AIR 9, GEO 3 and GEO 6 heat pumps utilise the latest compressor technology to ensure that the heat output is continuously matched to the home's requirements.

Many benefits

The compact design and numerous functions combined in one unit ensures minimum installation, space requirements, as well as rapid and easy installation. The latest technology and high-quality components not only provide an optimum indoor climate, but also low annual operating costs, making this a sound investment in every respect.



ONE UNIT - SEVERAL SOLUTIONS

COMPACT P SERIES BY NILAN

Since Compact P is module-based, it offers not just one, but several solutions. The unit can be combined with a geothermal or an outdoor air heat pump that can be fully integrated into Compact P. As either a supplementary or total heating solution, Compact P combines up to five functions:

- Ventilation with active and passive heat recovery
- Comfort heating
- Comfort cooling
- Sanitary hot water production
- Heating of the home (with AIR 9 or GEO 3/6)

Compact P

- Ventilation with heat recovery
- Sanitary hot water production

Compact P can ventilate up to 300 m³/h and recovers more than 100 % of the energy from the extracted air via a counter flow heat exchanger that is combined with a heat pump.

The heat pump produces hot water and contributes to heating the supply air.

The heat pump has a reversible cooling circuit, so that in the summer it can cool the intake air while it also producing hot water.

Compact PEK has a built in electrical kettle to heat the home via the central heating system.



Compact P AIR 9

- Ventilation with heat recovery
- Sanitary hot water production
- Space heating via an air/water heat pump

Besides ventilating the home and producing hot water, Compact P AIR 9 can also heat the home via underfloor heating or low-energy radiators.

AIR 9 is an air/water heat pump with a high heat output and a low energy consumption.



Compact P GEO 3/6

- Ventilation with heat recovery
- Sanitary hot water production
- Space heating via a geothermal/water heat pump

Besides ventilating the home and producing hot water, Compact P GEO 3/6 can also heat the home via under floor heating or low-energy radiators.

GEO 3 and GEO 6 are geothermal heat pumps that both have a high output and low energy consumption compared to their sizes.



COMPACT P

Product description

Compact P is an energy-efficient total indoor climate solution for all types of low-energy buildings, single-family homes, flats and small office areas in commercial leases with a ventilation requirement of up to 300 m³/h.

Compact P recovers the energy from the extracted air using a highly efficient counter flow heat exchanger. The remaining energy that is not utilised by the counter flow heat exchanger is used by the heat pump to produce hot water, and to further heat the supply air.

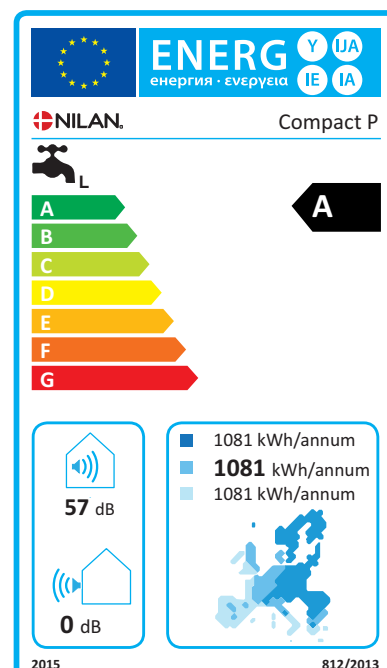
The heat pump has a reversible cooling circuit, which means that, in the summer, the unit can cool the supply air by up to 10 °C. Due to the low air exchange, the cooling does not function as an air conditioning system. On cooling, the supply air is dehumidified, which gives a more pleasant indoor climate than is possible with an ordinary ventilation unit without a heat pump.



Future-proof system

Compact P hot water production fulfils the most stringent requirements in the ecodesign regulation and thereby achieves the highest energy labelling.

The system is tested by an independent testing institute and has achieved the demanding Passive Building Certificate, as further confirmation that this is a highly energy-sustainable solution.



Time-controlled filter change alarm.
Easy filter access by opening the top front panel with the help of two finger screws.

There is plenty of space to replace filters and to vacuum clean the filter space.



A clear, user-friendly operating panel with help texts is included.

The modern CTS 700 control runs Modbus communication.

Heating pump with hermetically sealed cooling circuit, for production of hot water and active heat recovery. Can raise the air intake temperature up to 34 °C.

Reversible cooling circuit that can also cool the air intake in the summer up to 10 °C, with simultaneous hot water production.

The LAN cable is led down, so that the control can be easily accessed without using tools.

Electrically monitored sacrificial anode and corrosion protection.

On any need for replacement, an alarm is activated in the operating panel.

180 l hot water tank.
2 layers of glass enamelling to ensure a long lifetime.

Attractive white-painted front with large front panels, giving easy access to service the system.

The cabinet has holes for pipes and tubes for water and heating installations.



Intelligent moisture control.
Adapts ventilation to the home's current humidity level. See page 12.

CO₂-sensor can be purchased, for further demand management.

Low-energy EC-ventilators with B-wheel, adjustable from 20 to 100%.



Counterflow heat exchanger in polystyrene, with a temperature efficiency ratio of up to 94%.

Automatic bypass function that carries the air past the counterflow heat exchanger when heat recovery is not required.

A powder-coated condensation tray prevents the formation of "acid water", leading out the condensation water.

Compact P has an integrated water lock.

1.5 kW electrical completion.
For high hot water consumption where the heating pump cannot cope.

The hot water tank is foam-insulated, giving good insulation and saving energy.

Automatic anti-legionella.

Compact P is also offered in a Polar version with a built-in preheating element to frost proof the counterflow heat exchanger and heat pump.

TECHNICAL DATA

Technical specifications

Dimensions (W x D x H)	900 x 610 x 2065 mm
Weight	202 kg
Plate type casing	Aluzinc steel plate, white powder coating RAL9016
Heat exchanger type	Polystyrene counterflow heat exchanger
Fan type	EC, constant rotation
Filter class	Standard G4
Duct connections	Ø 160 mm
Condensate drain	PVC, Ø 20x1,5 mm
Refrigerant	R134a
Refrigerant filling	2 kg
Capacity SHW tank	180 L
Supplementary electrical heating (sanitary hot water)	1,5 kW
Connection dimension	3/4"

Supply voltage	230 V (±10 %), 50/60 HZ
Max. input/power (*3)	2,2 kW/ 9,6 A
Max. input/power (*4)	3,4 kW/14,8 A
Tightness class	IP31
Standby power	3 W
Ambient temperature	-20/+40 °C
Power consumption build-in preheating element (Polar)	1,2 kW
External leakage (*1)	< 1,4%
Internal leakage (*2)	< 1,1%

*1 At ± 250 Pa and 265 m³/h according EN 308/EN 13141-7.

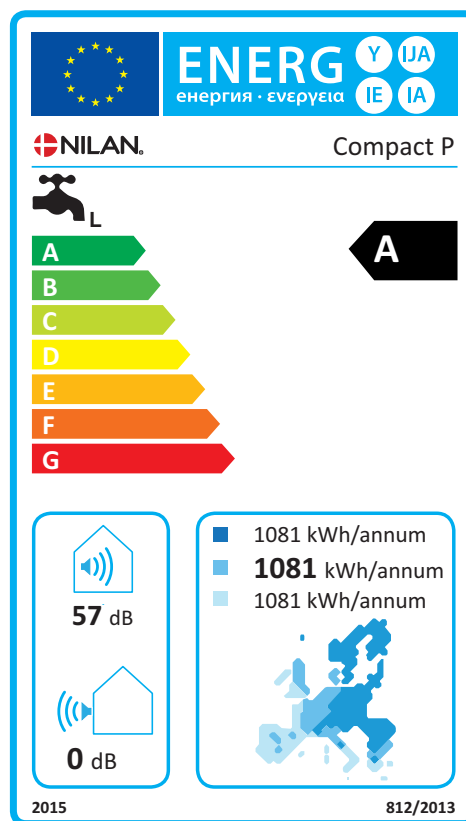
*2 At ± 100 Pa and 265 m³/h according EN 308/EN 13141-7.

*3 Input without heating element (accessory).

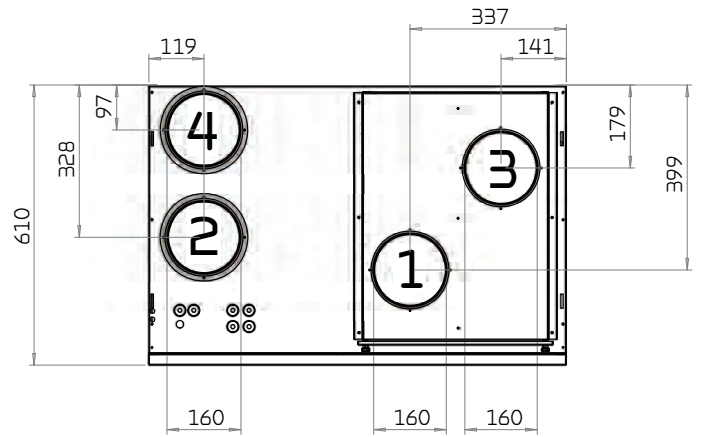
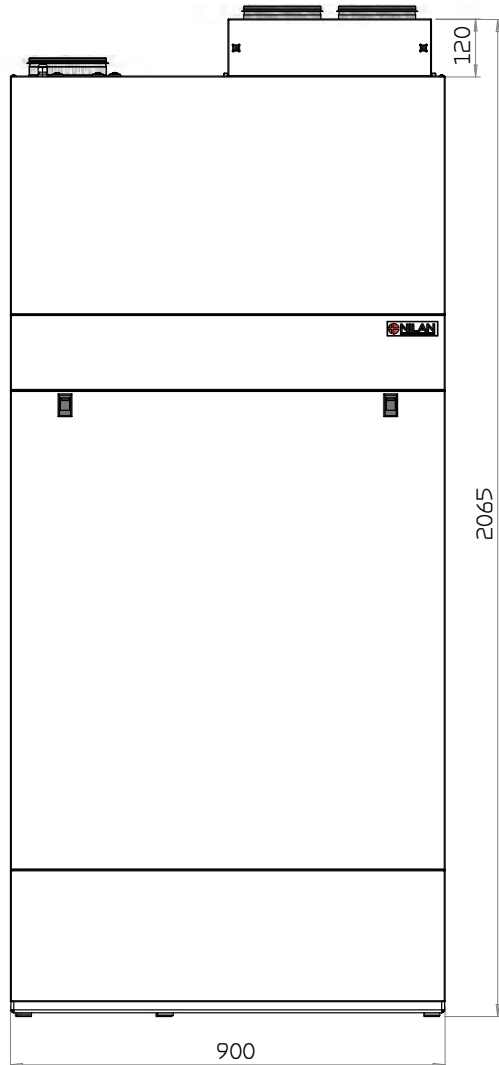
*4 Input Compact Polar

Hot water production

Consumer profile, water heater	L (large)
Energy efficiency class	A
Energy efficiency for water heating - average climate	94 %
Annual electricity consumption - average climate	1081 kWh/annum
Temperature settings on the thermostat	10 - 65 °C
Sound power level L _{WA}	57 dB(A)
The water heater can function outside peak load periods (Smart-grid)	No
Guidelines for assembly, installation and maintenance	See installation instructions
Energy efficiency for water heating - cold climate	94%
Energy efficiency for water heating - warm climate	94%
Annual electricity production - cold climate	1081 kWh/annum
Annual electricity consumption - warm climate	1081 kWh/annum



Dimensional drawing



Connections

- 1: Fresh air
- 2: Supply air
- 3: Extract air
- 4: Discharge air

MULTI-FUNCTIONAL



100 % heat recovery

Compact P ventilates the home, ensuring a good indoor climate. While also producing hot water.

Compact P is an untraditional ventilation unit that, in contrast to other ventilation units, recovers 100% of the heat in the extracted air.

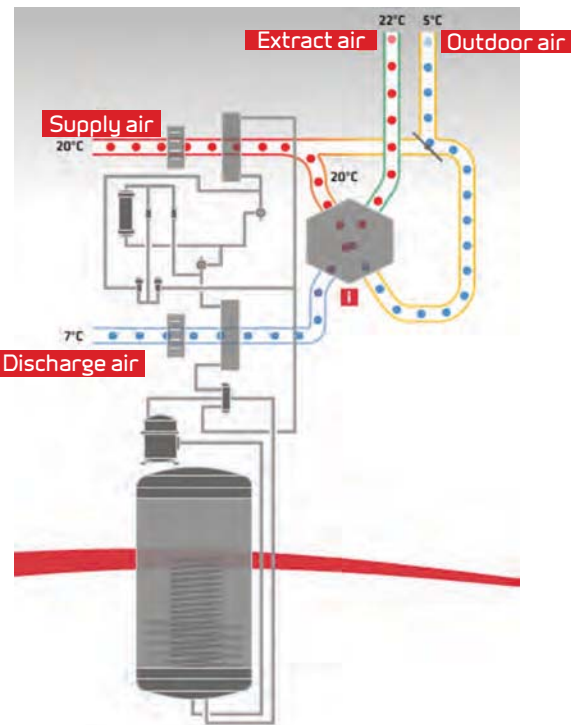
Via a counter flow heat exchanger, up to 95 % of the energy in the extracted air is used to heat the supply air.

The built-in heat pump uses the remaining energy to further heat the supply air, while also producing hot water.

Cooling the home is the challenge of the future

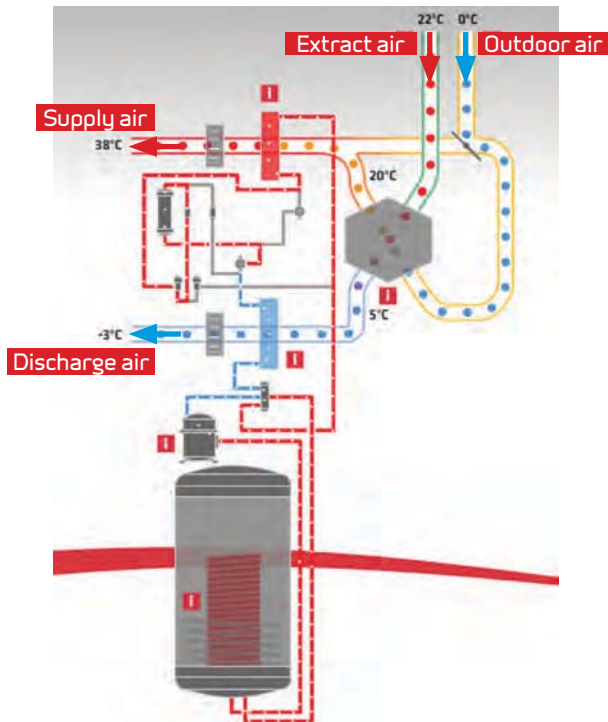
New homes are well-insulated and therefore easy to heat. On the other hand, outdoor temperatures do not need to be very high before getting rid of the heat in the home becomes problematic.

Compact P has a reversible cooling circuit, to cool the supply air. Due to the low air exchange, it will not function as an air conditioning system. When cooling the supply air will be dehumidified, which contributing to a pleasant climate in the home.



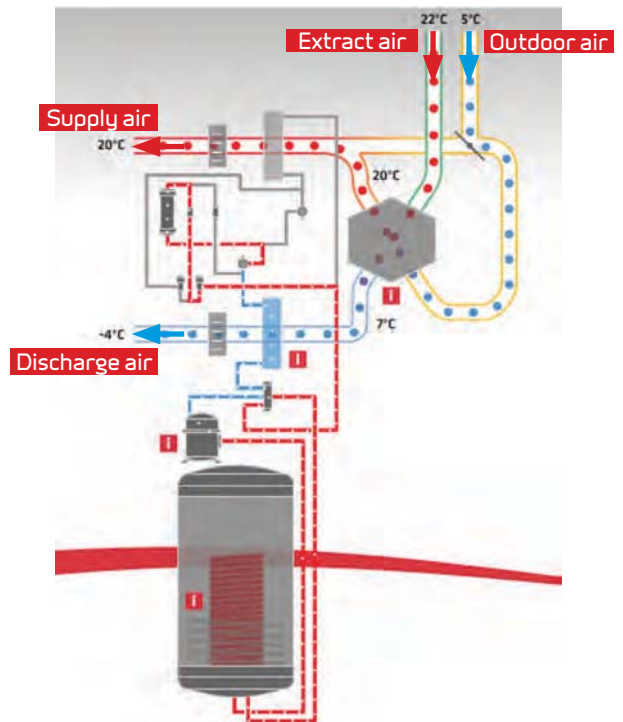
Passive heat recovery

Passive heat recovery takes place via a counter flow heat exchanger with a high temperature efficiency, whereby the supply air is heated by the extracted air.



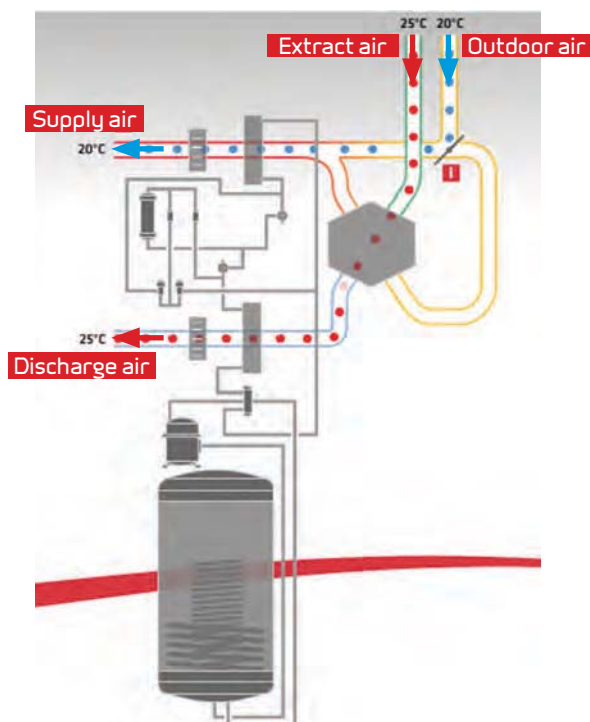
Passive and active heat recovery

Utilising the residual energy that the counterflow heat exchanger does not use, the heat pump further heats the supply air.



Hot water

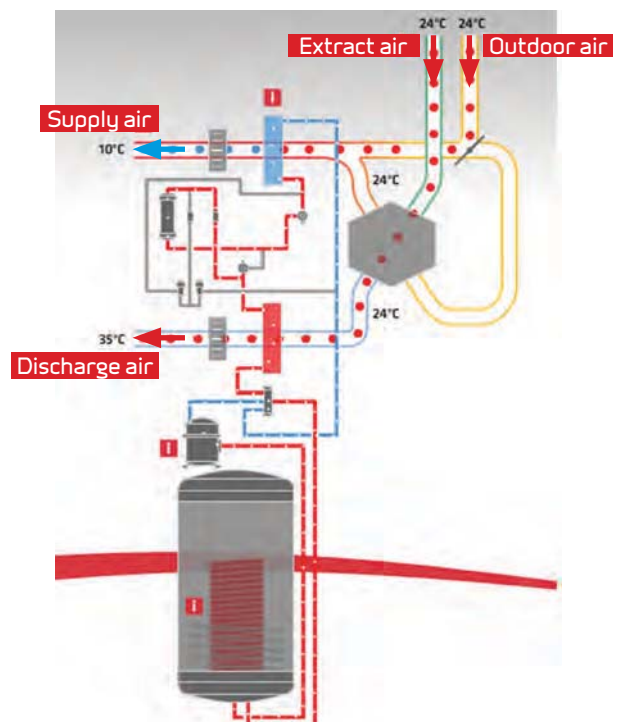
Utilising the residual energy that the counterflow heat exchanger does not use, the heat pump produces hot water.



100% bypass function

If heat recovery is not required, the bypass damper closes off 100% and leads the outdoor air past the heat exchanger.

Hot water can be produced at the same time. Hot water is produced with a high efficiency (COP).



Active cooling

The heat pump has a reversible cooling circuit and can cool the supply air during hot periods.

This function does not affect the production of hot water, which takes place with high efficiency (COP).

PLANNING DATA

Capacity

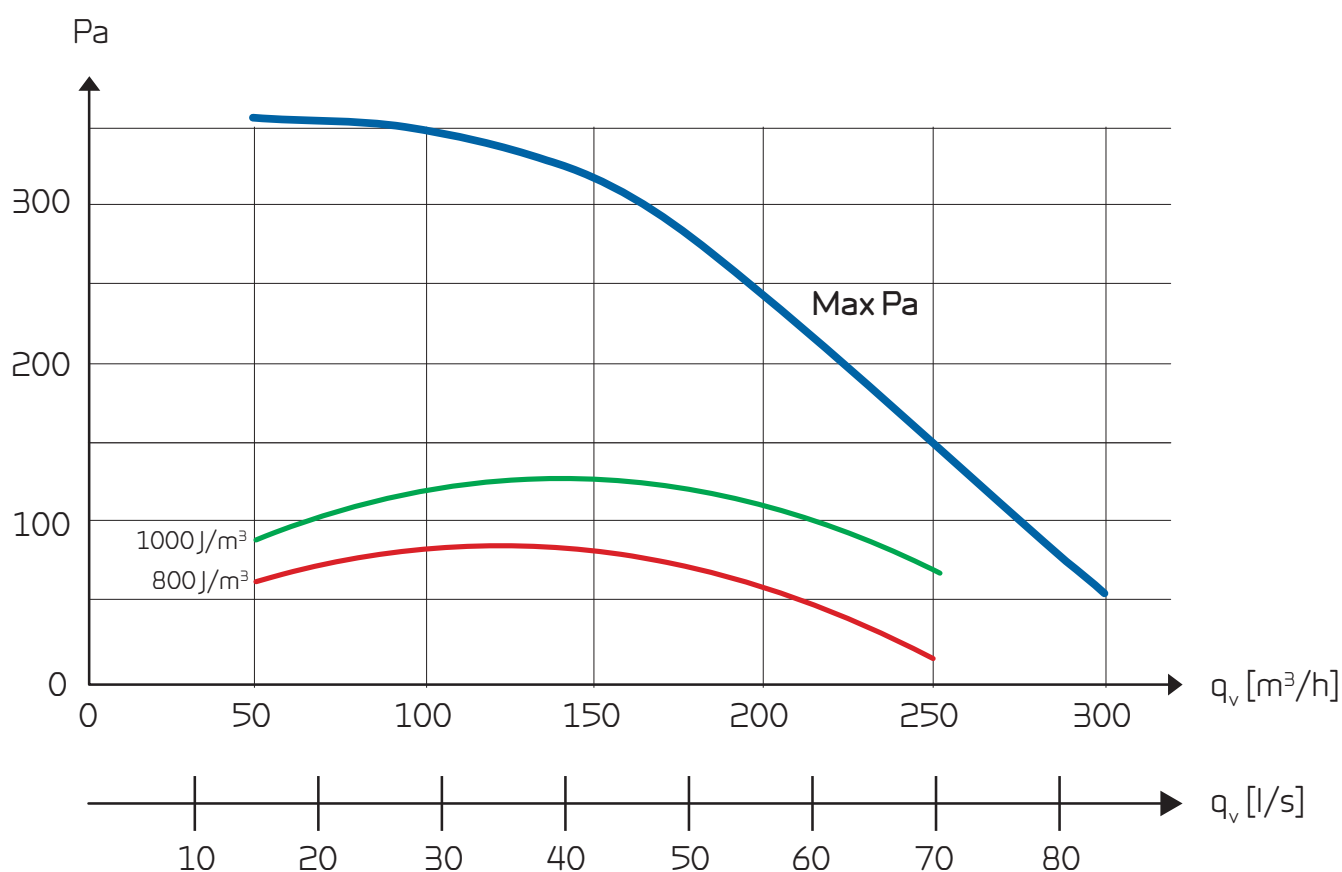
Capacity of standard unit as a function of q_v and $P_{t, ext.}$

SFP values according to EN 13141-7 are for standard units with G4 filters and without heating element.

SFP values comprise the unit's total power consumption incl. control.

Conversion factor: $\frac{J/m^3}{3600} = W/m^3/h$

Compact P is also available in a XL-version, which can provide an air volume of 415 m³/h at 100 Pa

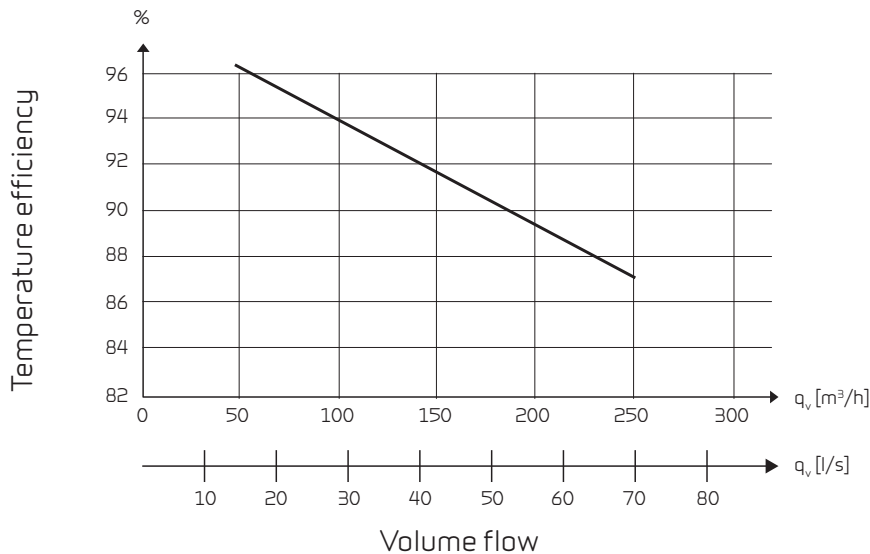


Temperature efficiency

Temperature efficiency for units with counterflow heat exchanger according to EN308.

Temperature efficiency EN308: $\eta_t = (t_{\text{supply air}} - t_{\text{fresh air}}) / (t_{\text{extract air}} - t_{\text{fresh air}})$

NB! Temperature efficiency is only for the counter flow heat exchanger (without heat pump operation)

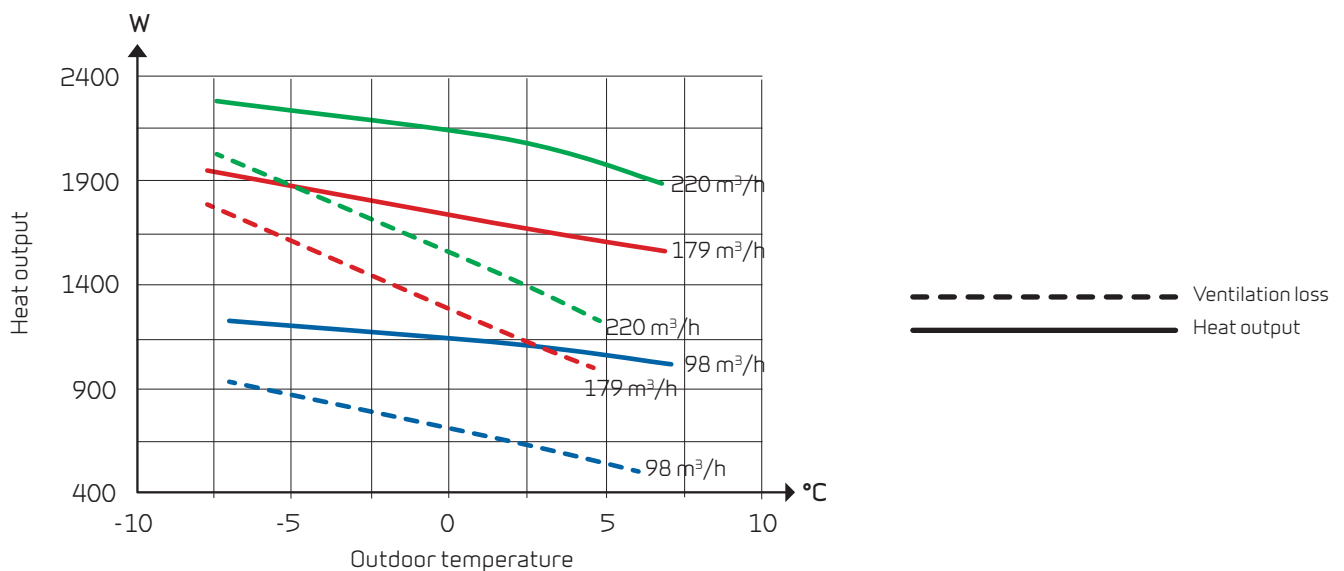


Heat output supply air

Heat output Q_c [W] as a function of q_v [m^3/h] and outdoor air temperature t_{21} [$^{\circ}\text{C}$]. In accordance with EN 14511, $t_{11}=21^{\circ}\text{C}$ (extract air)

Heat output is the contribution to room heating added to the fresh air via Compact P to the supply air.

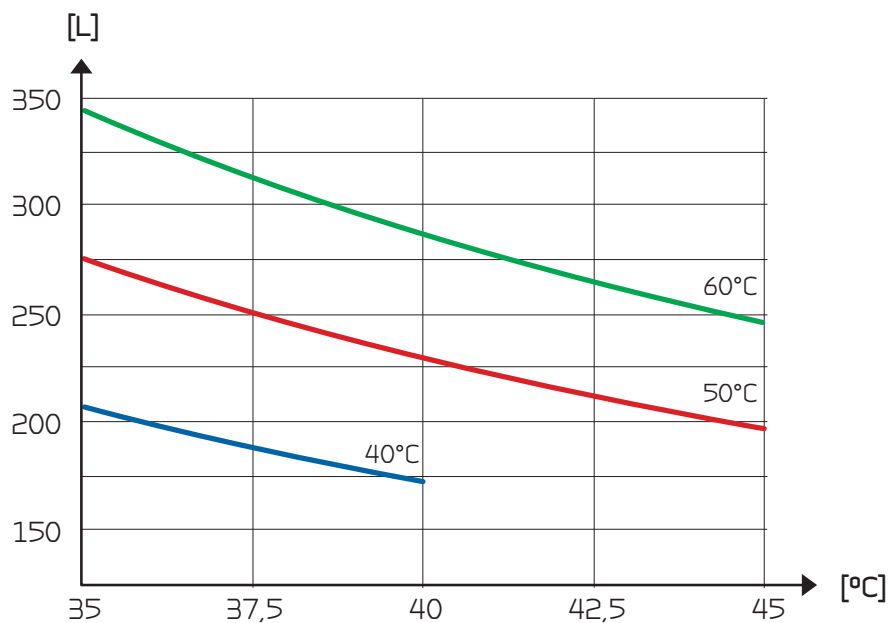
The ventilation loss is the heat output that is lost without heat recovery at the given volume flow air.



PLANNING DATA

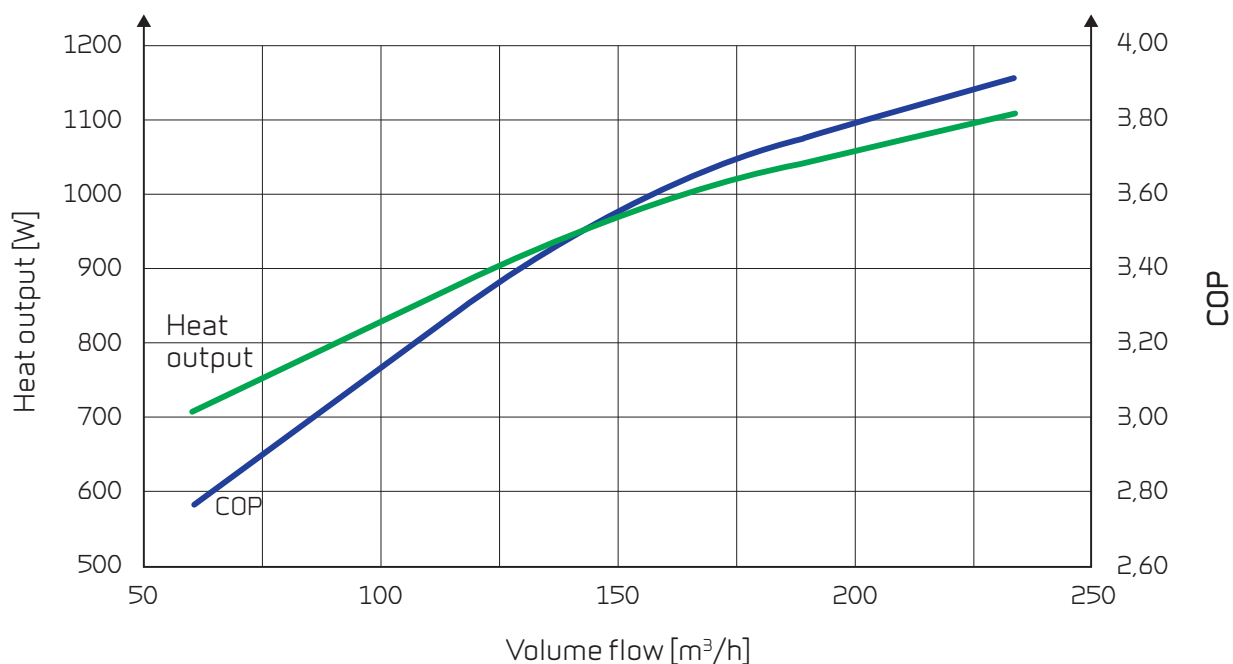
Tapped water

Tapped volume in litres $V_{\max}$ [L] from Compact P tank as a function of tapped temperature t [°C] and tank temperature at 40°, 50° and 60°C



COP (air-water)

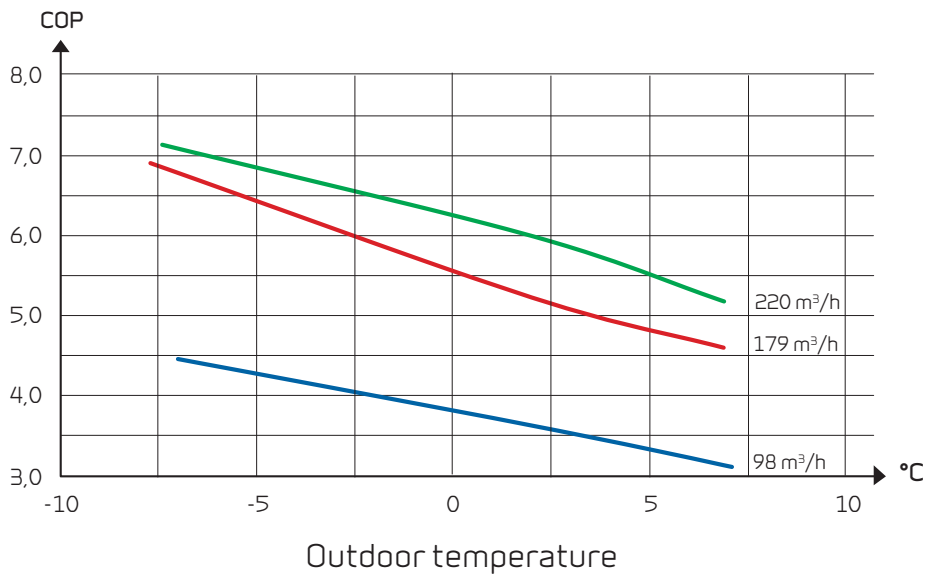
Heat output factor COP [-] and heat output Q_w for sanitary hot water as a function of the volume flow q_v [m³/h] at a tank temperature of 41°C and room temperature $t_{11} = 20^\circ\text{C}$, outdoor temperature $t_{21} = 20^\circ\text{C}$ in accordance with EN 255-3.



COP (air-air)

Heat output factor COP [-] supply air as a function of outdoor temperature t_{21} [°C] and volume flow q_v [m³/h] in accordance with EN14511 at a room temperature $t_{11} = 21^\circ\text{C}$

COP according EN14511 is calculated for the heat pump and counter flow heat exchanger combined.



Sound data

Sounddata is for $q_v = 210 \text{ m}^3/\text{h}$ and $P_{t, \text{ext}} = 100 \text{ Pa}$ in accordance with EN 9614-2 for surface and EN 5136 for ducts.

Sound output level L_{WA} drops with falling air volumes and falling back-pressure.

At a given distance, the sound pressure level L_{pA} will depend on the acoustic conditions at the installation site.

Sound output level (L_{wa})

Octave band Hz	Surface dB(A)	Supply air dB(A)	Extract air dB(A)
63	-	51	38
125	-	59	46
250	-	66	51
500	-	61	41
1.000	-	56	31
2.000	-	54	28
4.000	-	47	20
8.000	-	40	13
Total ± 2	57	69	53

AUTOMATION

CTS 700 styling



As standard, the control panel is delivered in a white casing. A black control panel can be ordered as an accessory.

The Compact P is controlled by its CTS 700 control panel, which provides a wide range of functions, including menu-controlled operation, weekprogrammes, time-controlled filter monitor, fan speed adjustment, temperature control, error messages etc.

The CTS 700's factory settings are default settings that can be adapted to operating needs and requirements, to achieve optimum operation and utilisation of the system.

The control panel must be placed in a dry, frost-free location, at least 1.5 m above floor level and min. 0.5 m from any corner. Avoid placing the panel on an external wall or in areas in direct sunlight.

Operating instructions for CTS 700 can be found in the separate user guide supplied with the system.

Intelligent humidity control

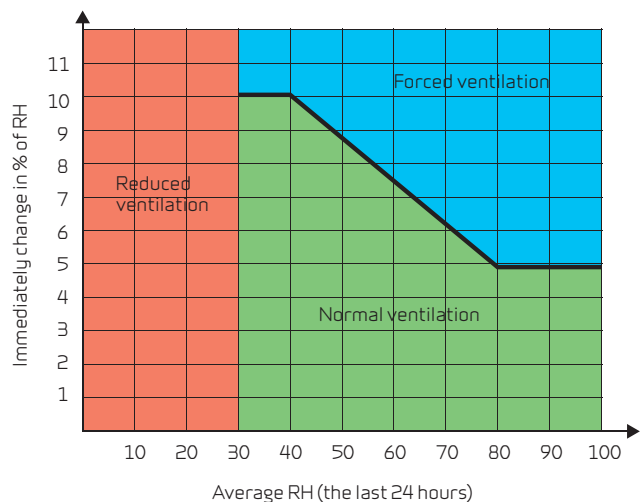
Nilan's humidity control automatically adapts to the needs of the family or the building.

The intelligent CTS 700 control unit does not need to have a set level input for air humidity (RH) to control the air exchange. By using the integrated humidity sensor, the control unit calculates the average level itself for the last 24 hours. The average level provides a basis for deciding whether to change the air exchange if the air humidity fluctuates.

This ensures that the unit always runs at its most efficient, based on the actual air humidity level and not on a theoretical one.

This helps save energy because it automatically adapts to the requirements in the home. Whether a large family or a single person is living in the building has a considerable influence on how much humidity is produced.

The unit also adjusts automatically to summer and winter level.



If the air humidity changes by more than 5-10% in relation to the average level, the unit responds with a higher rate of air exchange accordingly.

At an air humidity below 30% is reduced ventilation stp activated (adjustable between 15 and 45%)

Functional overview		+ Standard - Accessories
4 levels	The control function is divided into 4 levels: User/Super user/Installer/Factory with various options at each level	+
Weekly plan	There is an option for you to set your own weekly programme.	+
User option 1	This allows you to override the operating mode in the main menu via an external potential-free contact or PIR sensor.	+
User option 2	This allows you to override the operating mode in the main menu via an external potential-free contact or PIR sensor. User option 2 has a higher priority than user option 1	+
User option 2 out	When user option 2 is used, at the same time an output signal is given	+
Alarms	The alarm list is featuring all alarms. A list with alarmlog are show for the last 14 days.	+
Datalog	Opportunity for datalog	
Filter monitor	Filter monitor with timer (factory setting of 90 days). Adjustable to 30/90/180/360 days.	+
Bypass	Bypassing the outdoor air reduces heat recovery, enabling the desired supply air temperature to be maintained spring, summer and autumn.	+
Air quality	Allows you to choose whether to switch humidity sensors and/or CO ₂ sensors on and off.	+/-
Humidity control	Allows you to set a higher or lower ventilation step in the case of high/low air humidity.	+
CO ₂ control	Allows you to set a higher or lower ventilation step in the case of a high/low CO ₂ level.	-
Air exchange	Allows you to select a low ventilation step in the case of low outside temperatures and air humidity.	+
Night setback	A possibility to set back the ventilation and temperature a night	+
Defrost function	Temperature-based automatic function for defrosting the heat exchanger.	+
Frostprotection	In case of failing heating system, the unit is turned off to avoid further cooling with a risk of the water heating coil frost bursting.	+
Temperature control	Allows you to select the temperature sensor which will control the unit. • TPanel (panel sensor) • T3 EXHAUST (extract air)	+
Air volume	Allows you to set the ventilation flow stepless from 20 to 100 %.	+
Summer/Winter operation	The unit automatically changes to summer or winter operation.	+
Legionella control	It is possible to choose a weekday or a day during the month, where the sanitary hot water temperature reaches 65 °C, for example between 1 and 6 o'clock.	
Fire alarm	This allows you to connect fire-detecting thermostats, smoke detectors and other fire alarm contacts. In case of an alarm, smoke dampers are closed and the unit stops.	+
Joint alarm	Outlet for joint alarm	+
Cooling	Via bypass or heat pump. The heat pump has a reversible circuit, which means that the units circuit is reversed and the unit cools, rather than heating, the supply air. It is possible to choose whether the unit is to run a higher or highest ventilation stage during cooling. Via a weekly plan night cooling can be set up.	+
External heating element	• Temperature sensor T7 is an supply air sensor • Integrated frost protection for external water heating element • Motorised valve and circulation pump control unit	-
External electric heating element	• Temperature sensor T7 is an supply air sensor • Overheating protection	-
Delayed start-up	There is a possibility for a delayed start-up by the fans, when a closing damper is installed.	+
External network	It is possible to connect the unit to an external network.	+
Reset	Allows you to restore the factory settings.	+
Language	Option for setting the relevant language (Danish/German/English).	+

COMMUNICATION

Network communication

The CTS 700 control can be accessed via a PC application that is accessible for installation technicians.

The system can be connected directly to a PC, or connected via a local network and accessed via the network.

This makes it possible to remote control/control the system by connecting to the local network via the internet. It is recommended to create a fixed IP address for the network, in order to access the network without problems.

This makes it possible to offer the user a service contract, as the system can be monitored and controlled from any location, as long as there is an internet connection.



Modbus communication

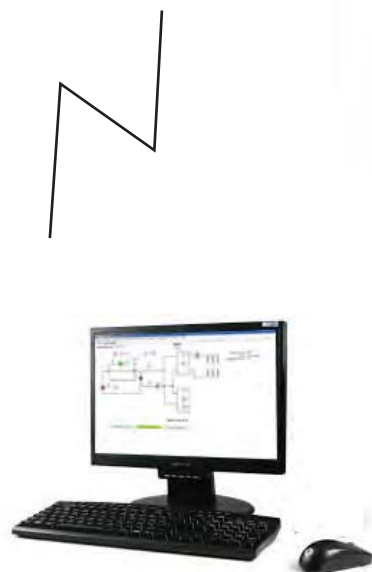
The CTS 700 control communicates as standard with Modbus TCP/IP communication. A CTS system using this form of communication can easily be connected to the unit.

Nilan units have an open Modbus communication, i.e. not only can the unit be monitored, but its operation can also be set in the same way as it can via the operating panel.

The protocol is set up by default for a Modbus TCP/IP.

IP-adress: 192.168.5.107 Port: 52 (adjustable)

A Modbus converter allows you to connect one or more units to a computer to monitor and control the units.



CCDI-SYSTEM

COMPACT P BY NILAN

All ventilation units with highly efficient heat recovery will ice up at extremely low outdoor temperatures.

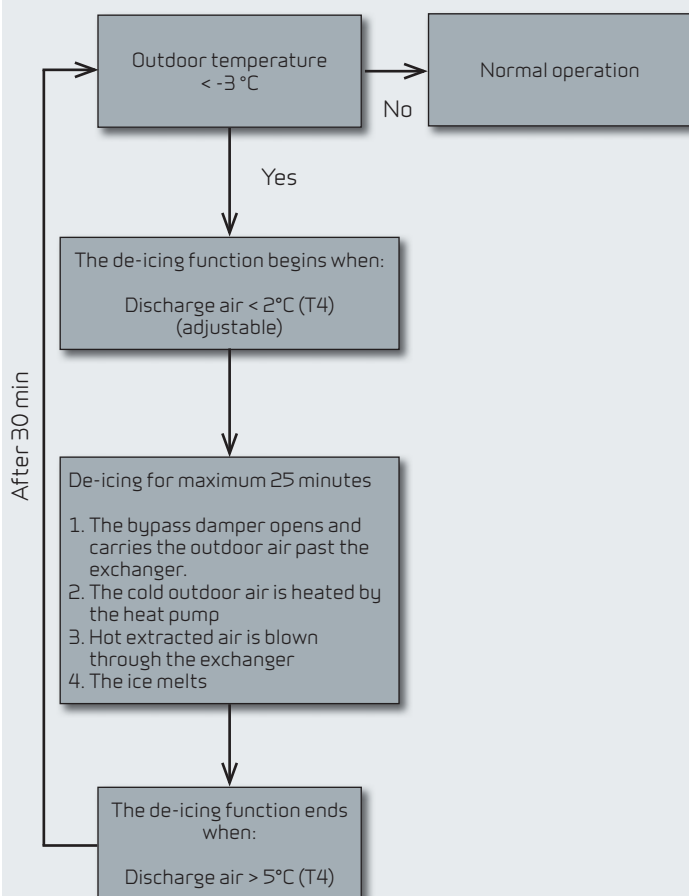
The extracted air condenses when it is cooled during heat recovery. Due to the high temperature efficiency, the condensation will slowly be converted into ice, which will block the counter-flow heat exchanger, unless action is taken.

It must be considered whether the unit's balanced operation should be protected in continuing frosty conditions, and whether shorter periods of imbalance or a lower air volume can be accepted.

Nilan standard de-icing

Compact P
(without preheating element)

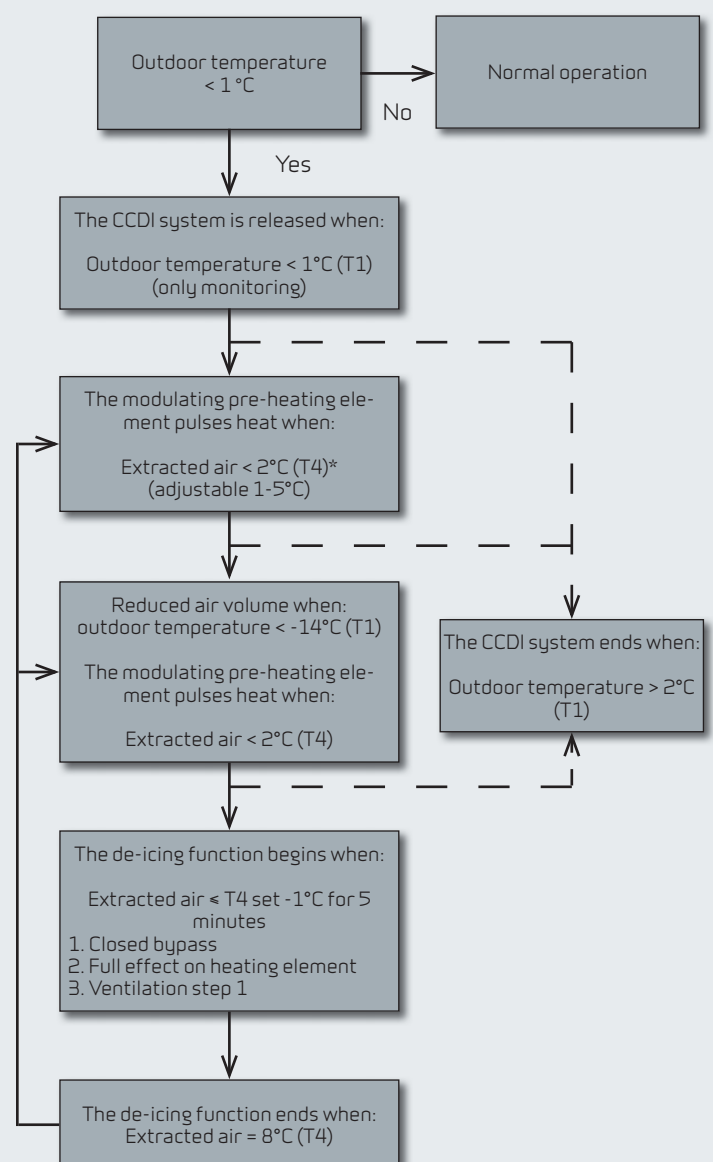
If Compact P without preheating element is selected, the unit will react to icing as described below.



Nilan CCDI-System (Condition Controlled De-ice System)

Compact Polar
(with built-in pre-heating element)

If Compact Polar is selected, it is controlled by Nilan's unique CCDI (Condition Controlled De-ice) system. This is a very precise, energy-efficient way of ensuring continuous operation of the unit right down to -14°C.



NB! All temperature settings are adjustable. On adjustment, they must be matched to the conditions in the home and the local climate.

ACCESSORIES



CO₂-sensor

With a CO₂-sensor installed, the ventilation speed can be pre-programmed with CTS 700 to run at a higher ventilation steps when CO₂ reaches high level in the extract air. CO₂-level is programmable.



Water heating element incl. regulation

The supply temperature can always be raised to the required level using a water heating element. The water heating element is designed to be built into the duct and must be connected to the primary heating supply. Supplied with two-way adjustment valve, temperature sensor and frost thermostat.



Electrical heating surface incl. regulation

When you fit an electrical heating surface, you can raise the fresh air temperature to the desired level at any time. The electrical heating surface is supplied ready to fit into the fresh air duct and, for easy fitting, the device is pre-fitted with all the required sensors.



Electrical pre-heating element (Frost protection)

An electrical pre-heating element heats up the outdoor air before it enters the unit. This avoids having to defrost the unit, resulting in a loss of power. There are temperature sensors supplied to be fitted in the ducts (Integrated in the Polar version)



EM-box

An EM-box allows heat recovery from the air from the range hood and thereby helps to heat the supply air. The EM-box is equipped with a special filter which efficiently cleans the range hood air of fat particles and thereby protects the system.



Pollen filter F7

A pollen filter class F7 can be fitted in the unit. The pollen filter is fitted with the G4 plate filter.



Top cover

To cover the ducting over the unit, Nilan offers a top cover in white-varnished alu-zinc (RAL 9016).

Solar

Extra heat exchanger of 0.7 m² in the hot water tank, which can be connected to an approximately 3 m² solar heating system, or other heat sources.

DELIVERY AND HANDLING

Transport and storage

Compact P comes in factory packaging that protects it during transport and storage.

Compact P must be stored in a dry place in its original packaging until installation. The packaging should only be removed immediately prior to installation.

Lifting cover

Lifting cover for Compact P makes it possible to lift Compact P off the pallet without making any heavy lifts and transport the system around in the home. Detach the filter box and the system fits under an average inner door.



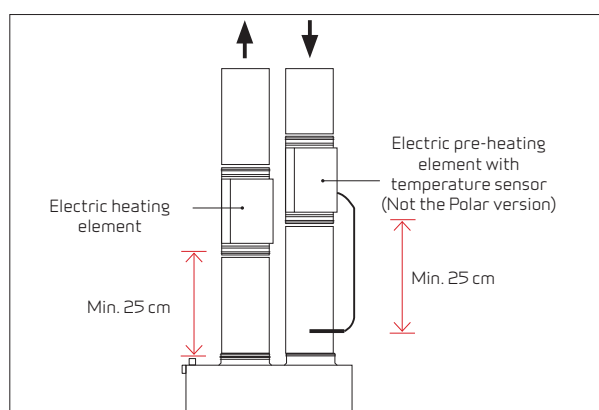
Installation conditions

During installation, future service and maintenance should be taken into account. We recommend a minimum gap in front of and behind the unit of 60 cm.

The unit must be installed level for the sake of the condensate drain.

Installation of electric heating element

Electric heating elements (accessories) are fitted in the duct. The fitter should ensure that there is a safe distance of at least 15 cm between the electric heating element and any inflammable material. The heating element must be insulated using fire-resistant insulation material. The electric heating element must be connected by an authorised electrician.



COMPACT P AIR 9

Product description

Compact P AIR 9 has the same benefits and functions as Compact P, but also has an integrated air/water heat pump, with connection to waterborne underfloor heating or low-temperature radiators for central heating.

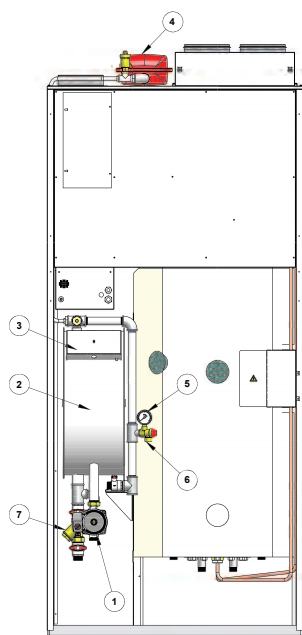
The solution consists of an integrated interior section in Compact P, as well as an exterior section that is easy to connect.

AIR 9 is delivered with a reversible heat pump, which also makes the unit capable of cooling.

AIR 9 is very silent and can be placed without disturbing its surroundings. During summer, when only hot sanitary water is needed, the fan is limited, reducing the noise level. This limit occurs when the outdoor temperature exceeds 15 °C and limiting the compressors output to a maximum of 60 %. These criteria can be set individually.

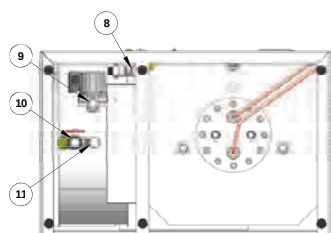
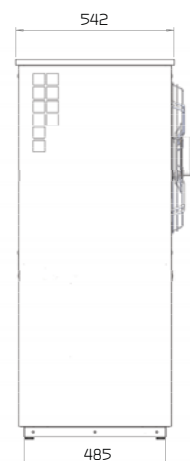
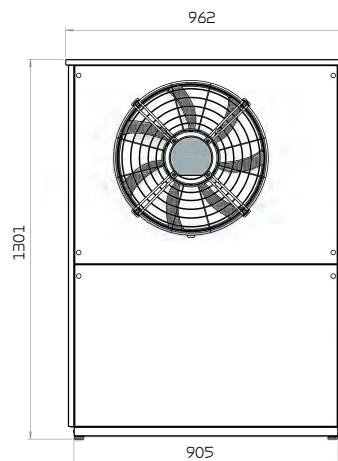


Inside unit for Compact P AIR 9



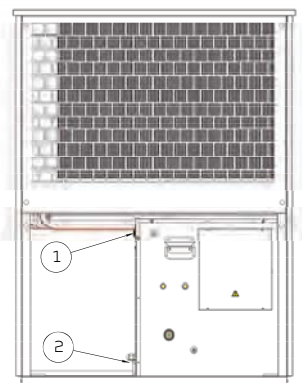
Front

1. Integrated circulation pump interior/ exterior sections 1"
2. 50-litre buffer tank
3. 2x3 kW supplementary electrical heating
4. Pressure expansion vessel (central heating circuit)
5. Manometer (central heating circuit)
6. Safety valve, 2.5 bar (central heating circuit)
7. Particle filter



Base

8. Flow, central heating 3/4"
9. Flow to exterior section 1"
10. Return flow from exterior 1"
11. Return flow from exterior 3/4"



1. Flow 1"
2. Return flow 1"



Effective and quiet ventilator with "owl wings".

Summer/winter setting ensures an extra low sound level in the summer.

Low-energy EC-motor.

AIR 9 exterior unit is made from white powder-coated aluzinc steel plate (RAL 9016).

Powder-coated condensation tray prevents "acid water" and leads off the condensation.

A heating cable for frost protection of the condensation drain is included.

Adjustment screws for levelling

AIR 9 is controlled via the same CTS 700 operating panel as is used for Compact P.



A large, well-dimensioned evaporator ensures a good output.

AIR 9 is reliable right down to -22°C

An inverter-controlled DC compressor ensures a variable output and low energy consumption.

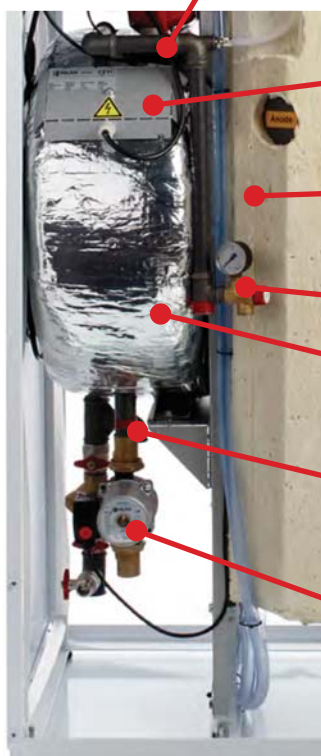
Hermetically-sealed cooling circuit.

The aggregate can therefore be installed without requiring a cooling technician.



AIR 9 interior unit is integrated in Compact P.

This saves space and ensures a neat and tidy installation.



Supplementary electrical heating of 2 x 3 kW
Ensures indoor heating during periods of severe frost.

8-litre expansion tank for central heating.
Placed on top of the system.

Safety valve to the central heating system.

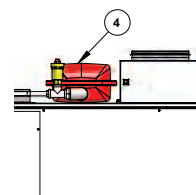
Manometer showing the current pressure in the central heating system.

50-litre buffer/charge circuit.
The central heating can thus be activated as required.

Filling tank for central heating.

Soil filter.

Integrated circulation pump to AIR 9 (exterior unit).



TECHNICAL DATA

Technical specifications

Dimensions (inside part) (W x D x H) - Integrated in Compact P	550 x 300 x 1100 mm
Weight (inside part)	55 kg
Control	CTS 700
Dimensions (outside part) (W x D x H)	962 x 542 x 1301 mm
Weight (outside part)	125 kg
Supply voltage (inside part)	400/230V 2L + N + PE, 50Hz
P _{MAX} (inside part)	4.1 kW
Fuse size (inside part)	16 A
Standby electricity consumption	2.5 W
Supplementary electrical heating	2 x 3 kW
Buffer tank (integrated)	50 L
Design pressure (central heating)	4 bar
Opening pressure safety valve (central heating)	2.5 bar
Expansion vessel (central heating)	8 Litre
Booster expansion vessels	0.5 bar G
Max. air volume	3400 m³/h
Variable compressor	30 - 100 %
Tightness class fan	IP54
Supply voltage (outside part)	400/230V 2L + N + PE, 50Hz
P _{MAX} (outside part)	3.3 kW
Fuse size (outside part)	16 A
Rated output, (max/min) A-Pump	31/99 W
Rated output, (max/min) A-Pump	0.2/0.63 A
Condenser pressure loss (central heating)	15 kPa/0.42 l/s
Central heating connection	3/4"
Refrigerant	R410A
Refrigerant filling	3,4 kg
Pressostat low pressure (on/off)	2.2/3.4 bar G
Pressostat high pressure (on/off)	42/33 bar G
Operating temperatures	-22 °C → 50 °C
Central heating, flow temperature	25°C → 45°C
Connection dimension	1"
Heat output P _H with variable compressor at 7°C/35°C, according to EN 14511:2012 (max. 5400 RPM)	8,4 kW
Heat output P _H with variable compressor at 2°C/35°C, according to EN 14511:2012 (max. 5400 RPM)	6,7 kW
Heat output P _H with variable compressor at -7°C/35°C, according to EN 14511:2012 (max. 5400 RPM)	5,7 kW
Heat output P _H with variable compressor at -15°C/35°C, according to EN 14511:2012 (max. 5400 RPM)	4,5 kW
Heat output P _H with variable compressor at 7°C/45°C, according to EN 14511:2012 (max. 5400 RPM)	7,8 kW
Heat output P _H with variable compressor at -7°C/45°C, according to EN 14511:2012 (max. 5400 RPM)	5,4 kW
SCOP testet according to EN 14825:2012*	5,11
P _{design} (t _{out} -10°C)	5,21 kW

*SCOP (Seasonal COP) is for "low temperature use, average climate, defined flow, reversible"

Sound

At 50% capacity at testpoint 7/6 and 30/35 °C according to EN 12102

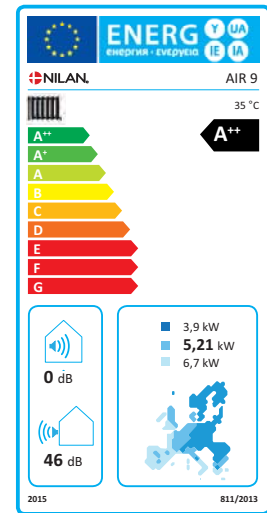
Distance to Outside unit (Meters)	1	3	5	10
LpA dB(A)	38	28	24	18

At 100% capacity at testpoint 7/6 and 30/35 °C according to EN 12102

Distance to Outside unit (Meters)	1	3	5	10
LpA dB(A)	55	45	41	35

Heat pump for space heating

Model	AIR 9
Air-to-water heat pump	Yes
Water-to-water heat pump	No
Brine-to-water heat pump	No
Low-temperature heat pump	Yes
Equipped with a supplementary heater	Yes
Heat pump combination heater	No



Item	Symbol	Value	Unit
Rated heat output	P_{rated}	5,21	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature of T_j			
$T_j = -7\text{ °C}$	P_{dh}	4,79	kW
$T_j = +2\text{ °C}$	P_{dh}	2,88	kW
$T_j = +7\text{ °C}$	P_{dh}	1,90	kW
$T_j = +12\text{ °C}$	P_{dh}	2,12	kW
$T_j = \text{bivalent temperature}$	P_{dh}	5,21	kW
$T_j = \text{operation limit temperature}$	P_{dh}	0	kW
For air-to-water-heating pumps $T_j = -15\text{ °C}$ (if TOL < -20 °C)	P_{dh}		kW
Bivalent temperature	T_{biv}	-10	°C
Cycling interval capacity for heating	P_{cyc}		kW
Degradation co-efficient	C_{dh}	0,94-0,99	

Power consumption in modes other than active mode

Off mode	P_{OFF}	0,01	kW
Thermostat off-mode	P_{TO}	0,005	kW
Standby mode	P_{SB}	0,01	kW
Crankcase heater mode	P_{CK}	0	kW

Other items

Capacity control:	Variable compressor Variable indoor water flow		
	Variable indoor temperature adjustment		
Sound power level, outdoors	L_{WA}	46	dB
Emissions of nitrogen oxides	Q_{HE}	1464	kWh

Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η_s	204	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature T_j			
$T_j = -7\text{ °C}$	COP_d	3,20	
$T_j = +2\text{ °C}$	COP_d	4,95	
$T_j = +7\text{ °C}$	COP_d	6,53	
$T_j = +12\text{ °C}$	COP_d	9,69	
$T_j = \text{bivalent temperature}$	COP_d	2,83	
$T_j = \text{operation limit temperature}$	COP_d	0	
For air-to-water heat pumps: $T_j = -15\text{ °C}$ (if TOL < -20 °C)	COP_d		
For air-to-water heat pumps: Operation limit temperature	TOL	-22	°C
Cycling interval efficiency	COP_{cyc}		
Heating water operating limit temperature	WTOL	45	°C

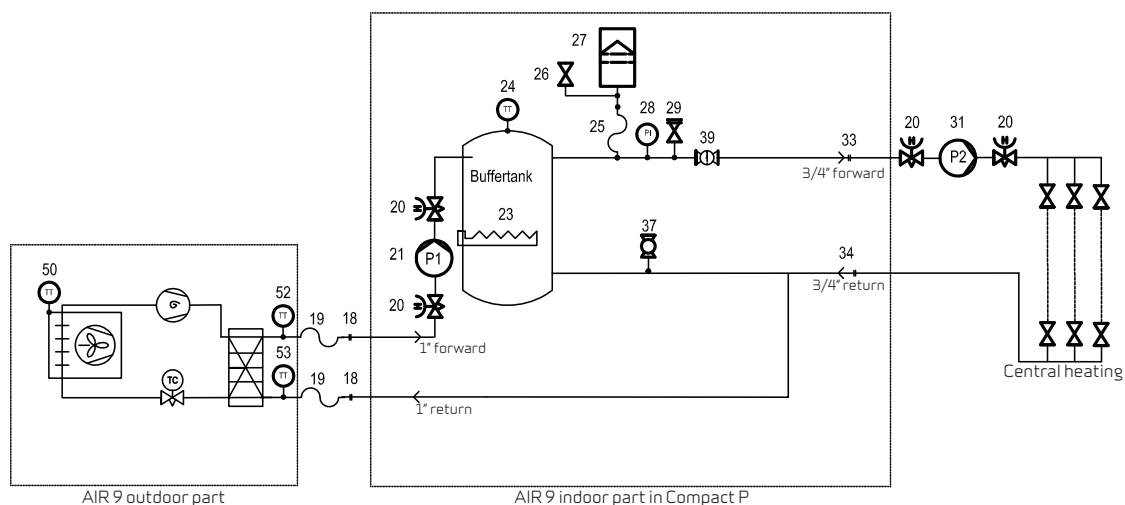
Supplementary heater

Rated heat output	P_{sup}	6	kW
Type of energy input	Electrical		

For air-to-water heat pumps: Rated air flow rate, outdoors		3000	m³/h
For water-/brine-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger			m³/h

INSTALLATION

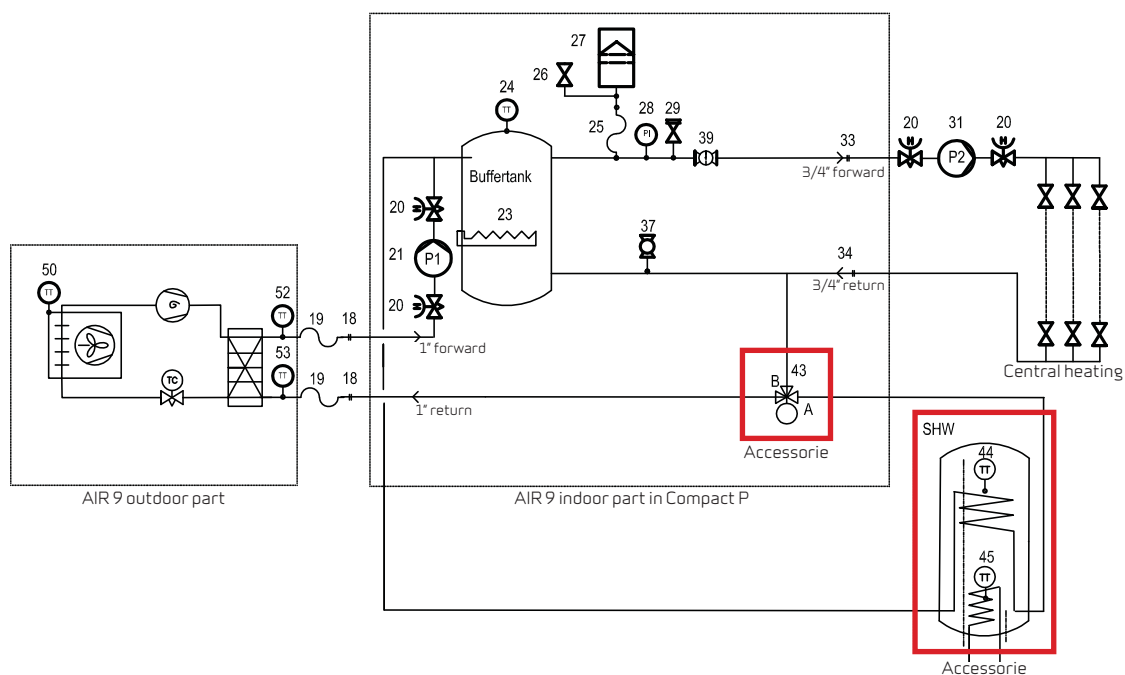
Compact P AIR 9

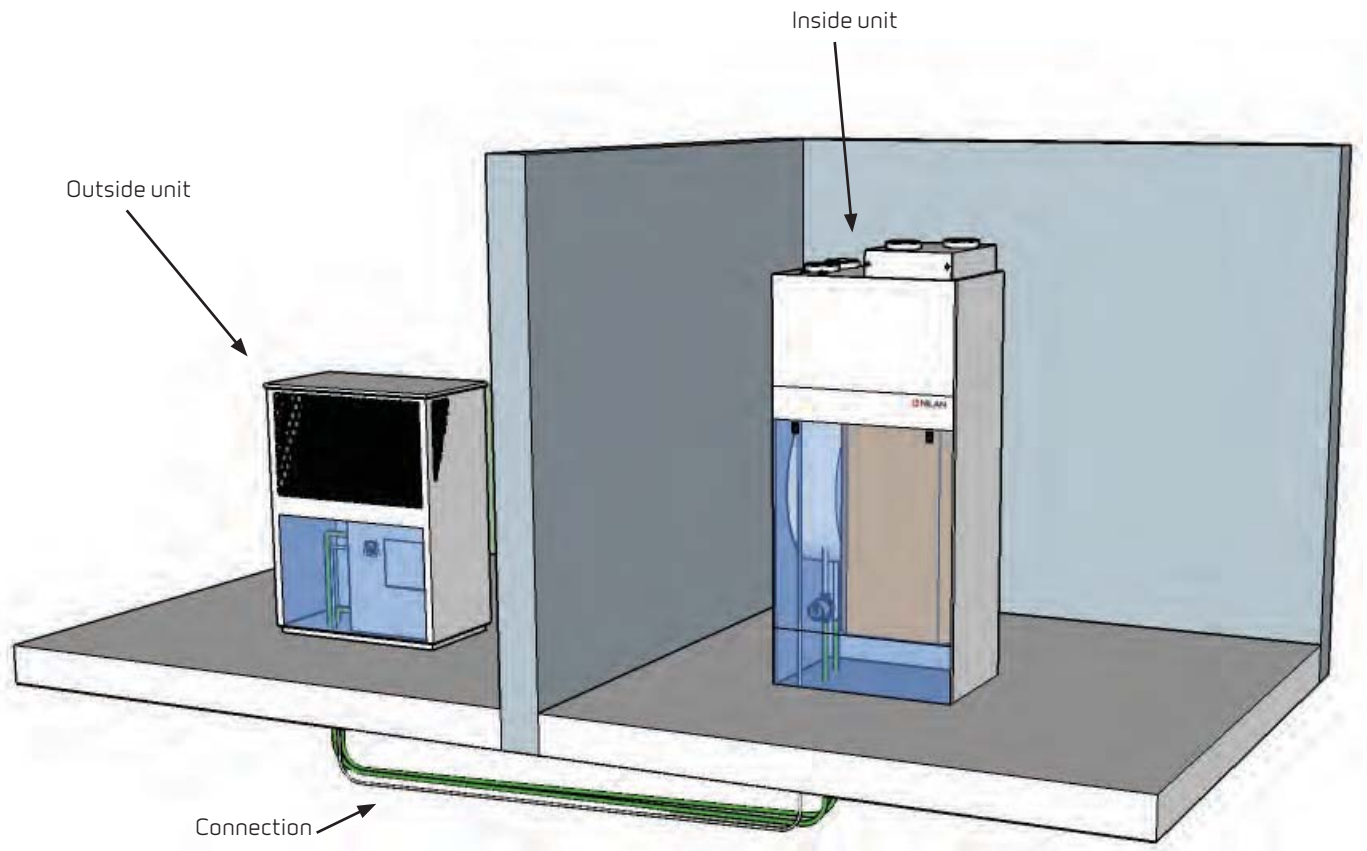


- 18 Connection 1"
- 19 Flexihose 1"
- 20 Shut-off valve
- 21 P1 circulation pump 130 mm
- 23 Supplementary electrical heating 2 x 3 kW
- 24 Temperature sensor T18 (centralvarme)
- 25 Flexihose 10 mm
- 26 Automatic control vent
- 27 Expansion tank 8 litre
- 28 Manometer
- 29 Safety valve 2,5 bar

- 31 P2 circulation pump
- 33 Connection 3/4"
- 34 Connection 3/4"
- 37 Feed cock
- 39 Shut-off valve
- 43 3-way valve
- 44 Temperature sensor T21
- 45 Temperature sensor T22
- 50 Temperature sensor evaporator
- 52 Temperature sensor T16
- 53 Temperature sensor T17

SHW warmwater-tank connected to Compact P AIR 9





Simple installation

AIR 9 is an outdoor air heat pump that is connected to the Compact P interior section via hydraulic tubes and a communication line.

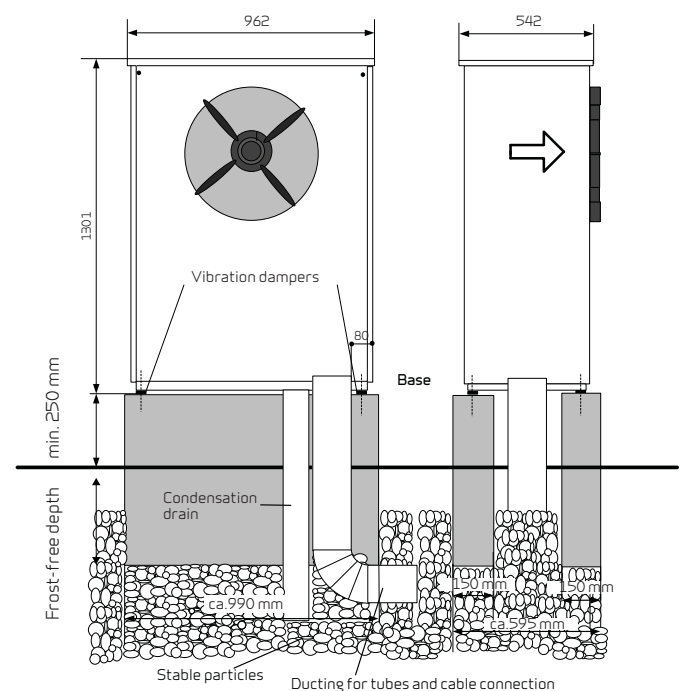
The hermetically sealed heat pump is installed in the outside part, with reliable operation right down to -22°C .

A circulation pump is mounted on the inside part, to pump the boiler water between the outside and inside sections. The circulation pump is a low-energy pump.

There is an integrated frost protection cable to ensure that the condensation drain does not freeze.

The outside part is run by CTS700 automatic controls via the control panel used for the Compact P.

AIR 9 is placed on a stable base, e.g. a cast foundation, and towards the prevailing wind direction.



COMPACT P GEO 3/6

Product description

Compact P GEO offers the same benefits and functions as Compact P, but additionally has an integrated geothermal pump, with connection to waterborne underfloor heating or low-temperature central-heating radiators.

The heat pumps are available in two sizes: GEO 3 (0.5 - 3 kW) and GEO 6 (1 - 6 kW). The variable compressor makes Compact P GEO a far more efficient and energy-friendly solution than traditional heat pumps that often have compressors with a constant output.

As the output is subject to variable regulation, the heat pump never uses more energy than necessary, which gives a very high SCOP. With GEO 3, a SCOP of 5.17 is achieved.

SCOP 5,15/5,17

Variable Compressor

8-litre expansion tank for brine and the central heating circuit.

2 kW electrical completion. Ensures indoor heating in very cold periods.

Hermetically-sealed cooling circuit. Installation without the help of a refrigeration fitter.

An inverter-controlled DC compressor ensures a variable output and low energy consumption.

Integrated circulation pump for the brine circuit.

GEO 3/6 is controlled via the same CTS 700 operating panel as is used for Compact P.

Integrated in Compact P.

Low-noise components ensure a product that does not have an adverse impact on the surroundings.

Installed manometer and safety valve for the brine circuit. Also included for the central heating circuit.



Technical specifications

GEO 3

GEO 6

Dimensions (W x D x H)	Integrated in Compact P 550 x 300 x 1,100 mm	Integrated in Compact P 580 x 300 x 1,100 mm
Weight	55 kg	55 kg
Control	CTS 700	CTS 700
Compressor variable speed	Yes (20-100%)	Yes (20-100%)
Installation site, room temperature	5°C → 35°C	5°C → 35°C
Supply voltage and connection	400/230V 2L+N+PE, 50Hz / 230V L+N+PE, 50 Hz	400/230V 2L+N+PE, 50Hz /
Fuse size	13A/20A	16A
Start current, I_{max} , Start	14A	14A
Standby electricity consumption	2.5 W	2.5 W
Supplementary electrical heating	1 x 2 kW	1 x 2 kW
Rated output, brine pump (max/min). A pump	87/6 W	87/6 W
Rated current, brine pump (max/min). A pump	0.7/0.06 A	0.7/0.06 A
Refrigerant	R410A	R410A
Refrigerant filling	1.1 kg	1.4 kg
Pressostat low pressure (on/off)	2.2/3.4 barG	2.2/3.4 barG
Pressostat high pressure (on/off)	42/33 barG	42/33 barG
Antifreeze	Ethylene glycol/water Ethanol/water	Ethylene glycol/water Ethanol/water
Antifreeze, brine	-20°C → -18°C	-20°C → -18°C
Design pressure brine/central heating side	4/4 bar	4/4 bar
Opening pressure safety valve brine/central heating side	3.5/2.5 bar	3.5/2.5 bar
Expansion vessel brine/central heating side	8/8 litres	8/8 litres
Booster expansion vessels	0.5 barG	0.5 barG
Environmental pressostat brine, leak alarm (on/off)	0.6/1.1 barG	0.6/1.1 barG
Heat output P_H with variable compressor	0.5-3 kW	1-6 kW
Central heating, flow temperature, operating area	25°C → 45°C	25°C → 45°C
Brine temperature to evaporator, operating area	-5°C → 20°C	-5°C → 20°C
Central heating pressure loss, condenser	10 kPa/0.14 l/s	15 kPa/0.29 l/s
Central heating connection	3/4"	3/4"
Brine pressure loss evaporator	10 kPa/0.19 l/s	15 kPa/0.39 l/s
Brine connection	1"	1"
COP 0/35°C at max. P_H , in accordance with EN14511:2012 with brine/ water $dT=3/5^\circ\text{C}^*$	4.5 (P_H max. 3 kW)	4,27 (P_H max. 6 kW)
EHPA tested and approved	N/A	Yes*
SCOP-tested in accordance with EN14825:2012**	5.17	5,15
Sound output level L_{WA} at 100% heat output 0/35°C	≤ 51 dB(A)	≤ 51 dB(A)
Sound output level L_{WA} at 50% heat output 0/35°C	≤ 44 dB(A)	≤ 44 dB(A)
Sound pressure level L_{pA} in 1 m at 100% heat output 0/35°C	≤ 40 dB(A)	≤ 40 dB(A)
Sound pressure level L_{pA} in 1 m at 50% heat output 0/35°C	≤ 33 dB(A)	≤ 33 dB(A)

*) Complies with "EHPA Test Regulations vers. 1.4, 2011-02-01" with max. output 3 kW at 0/35°C in accordance with EN14511:2012

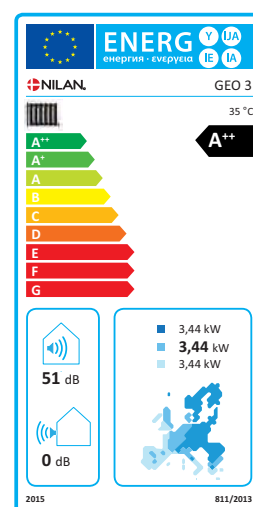
**) SCOP (Seasonal COP) is for "low temperature use, average climate, defined flow"

Sound data in accordance with EN12102 and EN ISO 9614-2

TECHNICAL PARAMETERS

GEO 3 Heating pump system for space heating

Model	GEO 3
Air-to-water heat pump	No
Water-to-water heat pump	No
Brine-to-water heat pump	Yes
Low-temperature heat pump	Yes
Equipped with a supplementary heater	Yes
Heat pump combination heater	No



Item	Symbol	Value	Unit
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Rated heat output	$\dot{Q}_{rated}$	3,44	kW
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Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature of T_i

$T_j = -7^\circ\text{C}$	<i>Pdh</i>	3,04	kW
$T_j = +2^\circ\text{C}$	<i>Pdh</i>	1,88	kW
$T_j = +7^\circ\text{C}$	<i>Pdh</i>	1,26	kW
$T_j = +12^\circ\text{C}$	<i>Pdh</i>	1,02	kW
T_i = bivalent temperature	<i>Pdh</i>	3,03	kW

T _j = operation limit temperature	<i>Pdh</i>	0	kW
For air-water-heating pumps T _j = -15 °C (if TOL < -20 °C)	<i>Pdh</i>		kW
Bivalent temperature	<i>T_{biv}</i>	-7	°C
Cyclling interval capacity for heating	<i>Pcych</i>		kW
Degradation co-efficient	<i>Cdh</i>	0,97	

Power consumption in modes other than active mode

Off mode	P_{OFF}	0,003	kW
Thermostat off-mode	P_{TO}	0,010	kW
Standby mode	P_{SB}	0,010	kW
Crankcase heater mode	P_{CK}	0,000	kW

Other items

Capacity control:	Variable compressor Variable indoor temperature adjustment		
	Fixed indoor water flow Fixed outdoor water flow		
Sound power level, indoors	L_{WA}	51	dB
Emissions of nitrogen oxides	Q_{NOx}	931	kWh

Item	Symbol	Value	Unit
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Seasonal space heating energy efficiency	η_s	206	%
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Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature T_i

$T_j = -7\text{ }^{\circ}\text{C}$	<i>COPd</i>	4,66	
$T_j = +2\text{ }^{\circ}\text{C}$	<i>COPd</i>	5,29	
$T_j = +7\text{ }^{\circ}\text{C}$	<i>COPd</i>	5,63	
$T_j = +12\text{ }^{\circ}\text{C}$	<i>COPd</i>	5,82	
T_j = bivalent temperature	<i>COPd</i>	4,61	

T _j = operation limit temperature	COP _d	0	
For air-to-water heat pumps: T _j = -15 °C (if TOL < -20 °C)	COP _d		
For air-to-water heat pumps: Operation limit temperature	TOL		°C
Cycling interval efficiency	COP _{cy}		
Heating water operating limit temperature	WTOL	52	°C

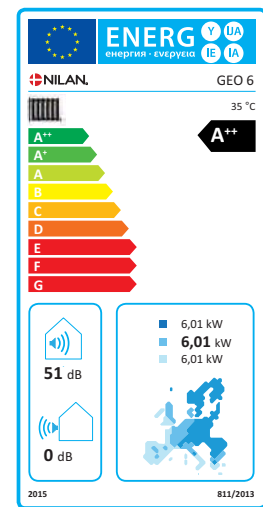
Supplementary heater

Rated heat output	P_{sup}	2	kW
Type of energy input	Electrical		

For air-to-water heat pumps: Rated air flow rate, outdoors			m³/h
For water-/ brine-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	0,518		m³/h

GEO 6 Heating pump system for space heating

Model	GEO 6
Air-to-water heat pump	No
Water-to-water heat pump	No
Brine-to-water heat pump	Yes
Low-temperature heat pump	Yes
Equipped with a supplementary heater	Yes
Heat pump combination heater	No



Item	Symbol	Value	Unit
Rated heat output	P_{rated}	6,01	kW
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature of T_j			
$T_j = -7\text{ °C}$	P_{dh}	5,29	kW
$T_j = +2\text{ °C}$	P_{dh}	3,32	kW
$T_j = +7\text{ °C}$	P_{dh}	2,09	kW
$T_j = +12\text{ °C}$	P_{dh}	1,30	kW
$T_j = \text{bivalent temperature}$	P_{dh}	6,01	kW
$T_j = \text{operation limit temperature}$	P_{dh}	0	kW
For air-to-water-heating pumps $T_j = -15\text{ °C}$ (if TOL < -20 °C)	P_{dh}		kW
Bivalent temperature	T_{biv}	-10	°C
Cycling interval capacity for heating	P_{cyc}		kW
Degradation co-efficient	C_{dh}	0,99 - 1	

Power consumption in modes other than active mode

Off mode	P_{OFF}	0,002	kW
Thermostat off-mode	P_{TO}	0,024	kW
Standby mode	P_{SB}	0,002	kW
Crankcase heater mode	P_{CK}	0,000	kW

Other items

Capacity control:	Variable compressor Variable indoor temperature adjustment		
	Fixed indoor water flow Fixed outdoor water flow		
Sound power level, indoors	L_{WA}	51	dB
Emissions of nitrogen oxides	Q_{HE}	2386	kWh

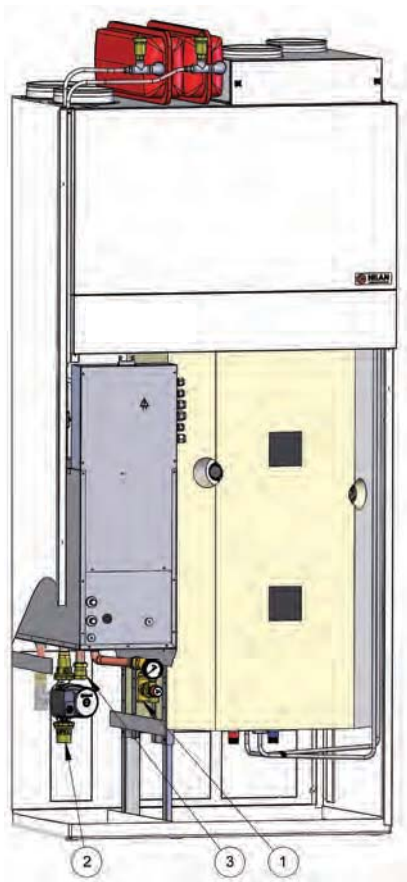
Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η_s	206	%
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature T_j			
$T_j = -7\text{ °C}$	COP_d	4,48	
$T_j = +2\text{ °C}$	COP_d	5,22	
$T_j = +7\text{ °C}$	COP_d	5,69	
$T_j = +12\text{ °C}$	COP_d	5,30	
$T_j = \text{bivalent temperature}$	COP_d	4,27	
$T_j = \text{operation limit temperature}$	COP_d	0	
For air-to-water heat pumps: $T_j = -15\text{ °C}$ (if TOL < -20 °C)	COP_d		
For air-to-water heat pumps: Operation limit temperature	TOL		°C
Cycling interval efficiency	COP_{cyc}		
Heating water operating limit temperature	WTOL	?	°C

Supplementary heater

Rated heat output	P_{sup}	0	kW
Type of energy input	Electrical		

For air-to-water heat pumps: Rated air flow rate, outdoors			m³/h
For water-/ brine-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger		1,041	m³/h

DIMENSIONS AND FUNCTION

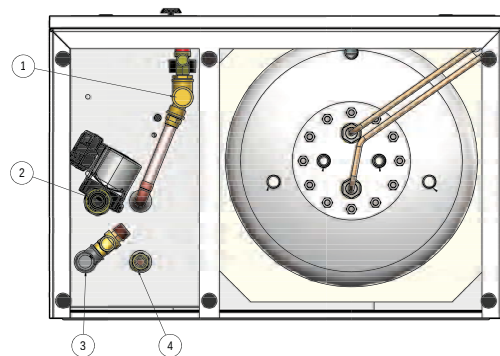


Front

1. Return flow to brine 1"
2. Flow from brine 1"
3. Return flow, central heating 3/4"

Base

1. Return flow to brine 1"
2. Flow from brine 1"
3. Flow from central heating 3/4"
4. Return flow central heating 3/4"

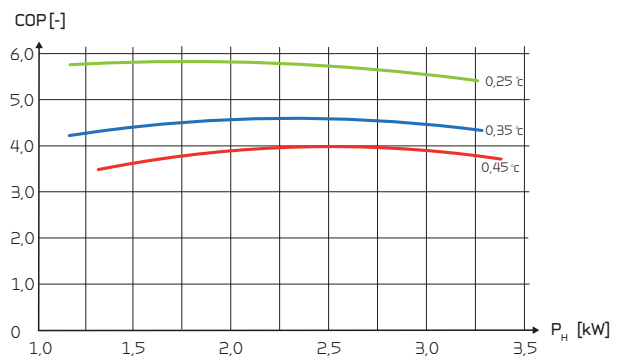


COP - GEO 3

In accordance with EN14511, COP is at 100% capacity (3.0 kW) for 0/35°C brine/water and flow brine 0.66 m³/h (0.19 l/s) and water 0.52 m³/h (0.14 l/s). Brine 30% ethylene glycol.

For the curves 0/25°C, 0/35°C and 0/45°C flow is maintained equivalent to 0/35°C 100% and the flow temperature and brine temperature to the evaporator are determined in accordance with EN14825.

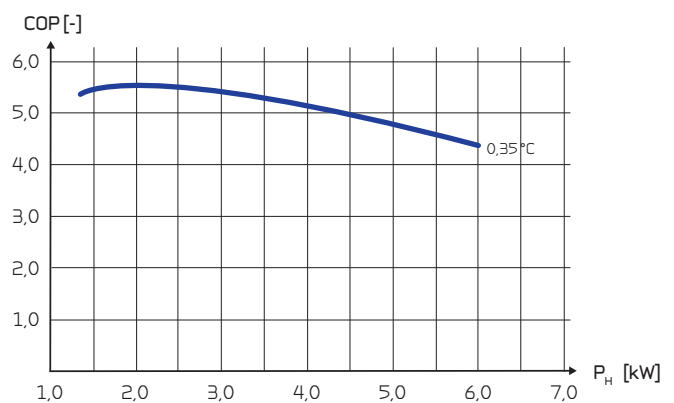
The heat output P_H is proportional to the compressor's revolutions.

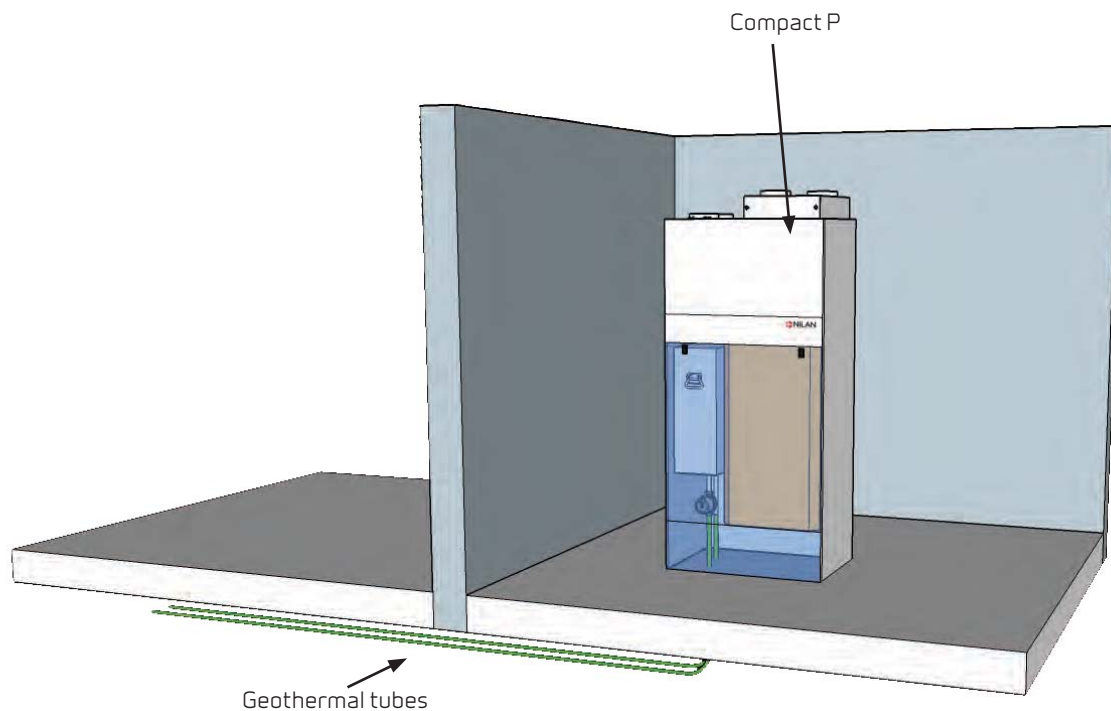


COP - GEO 6

In accordance with EN14511, COP is at 100% capacity (6.0 kW) for 0/35°C brine/water and flow brine 1.4 m³/h (0.39 l/s) and water 1.0 m³/h (0.29 l/s). Brine 30% ethylene glycol.

The heat output P_H is proportional to the compressor's revolutions.





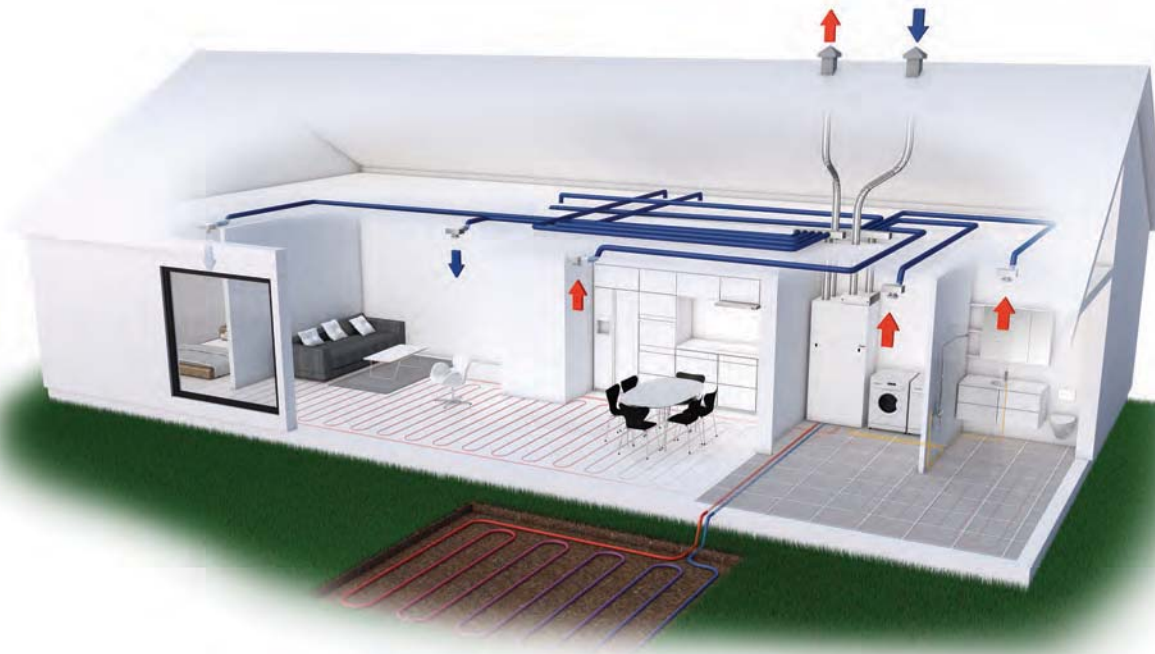
Simple installation

Compact P with integrated geothermal pump ensures a neat and tidy installation that requires very little space.

The GEO 3/6 geothermal pump is integrated in the Compact P cabinet and therefore does not require extra space. The geothermal tubes are drawn and connected directly to the heat pump in Compact P.

The geothermal pump is run by the CTS 700 automatic controls via the same used for the Compact P.

FUNCTIONS



Geothermal pump

GEO 3/6 is a geothermal pump that recovers energy from the ground to heat the home, and is not affected by periods of very cold weather. Heat is distributed in the home via Compact P for underfloor heating or low-energy radiators.

The GEO 3/6 interior section is integrated in the Compact P casing, giving a neat and tidy installation in the home.

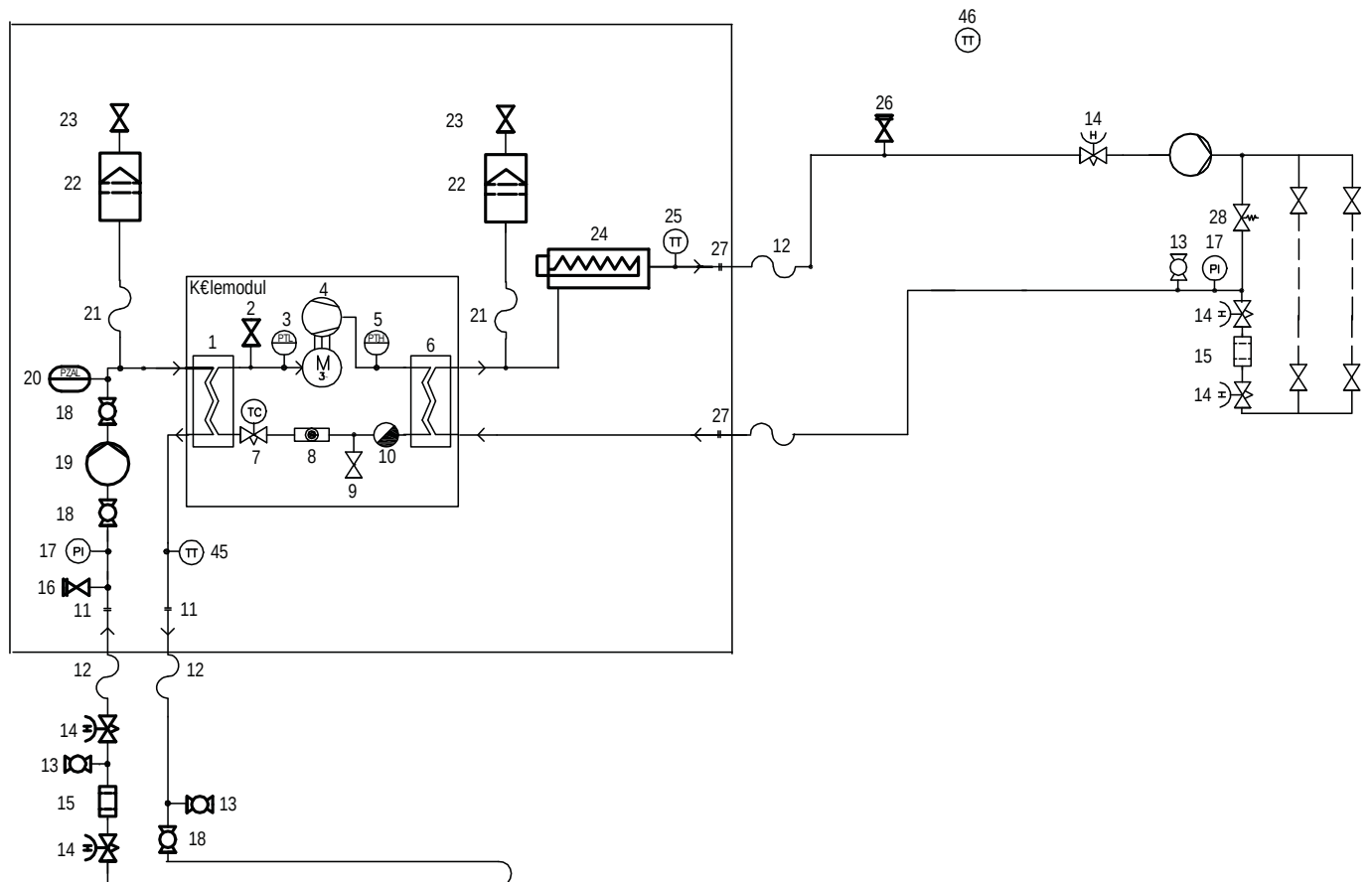
The heat pump has a hermetically-sealed cooling circuit and can therefore be installed without requiring a cooling technician.

Passive cooling

By adding an external heat exchanger, Compact P GEO 3/6 can also cool the home in the summer, if required.

The cold brine water is led through an external heat exchanger that cools the water in the central heating system.

Functional diagram



- 1 Evaporator
- 2 Service valve for low pressure
- 3 Low-pressure pressostat
- 4 Inverter-controlled DC compressor
- 5 High-pressure pressostat
- 6 Condenser
- 7 Expansion valve
- 8 Sight glass with humidity indicator
- 9 Service valve for high pressure
- 10 Filter drier
- 11 Connection 1"
- 12 Flexihose
- 13 Feed cock 1/2"
- 13 10-bar safety valve
- 14 Shut-off valve

- 15 Dirt filter
- 16 Safety valve 3,5 bar
- 17 Manometer
- 18 Ball valve
- 19 Circulation pump 130 mm
- 20 Brine pressure switch 0,6/1,1 bar
- 21 Flexihose 10 mm
- 22 Expansion tank 8 L
- 23 Automatic control vent 3/8"
- 24 Electric cartridge 2 kW
- 25 Temperature sensor T1 max. 45°C (central heating)
- 26 Safety valve 2,5 bar
- 27 Connection 3/4"

- 28 Overcurrent valve
- 45 Temperature sensor T4 (brine sensor)
- 46 Temperature sensor T3 (outdoor sensor)

COMPACT P SHW TANK

Product description

The SHW tank is a 250-litre hot water tank with a built-in solar coil and a geothermal heat pump supplementary coil that can be connected to all Compact P solutions. The solution is ideal for families with a high consumption of hot water.

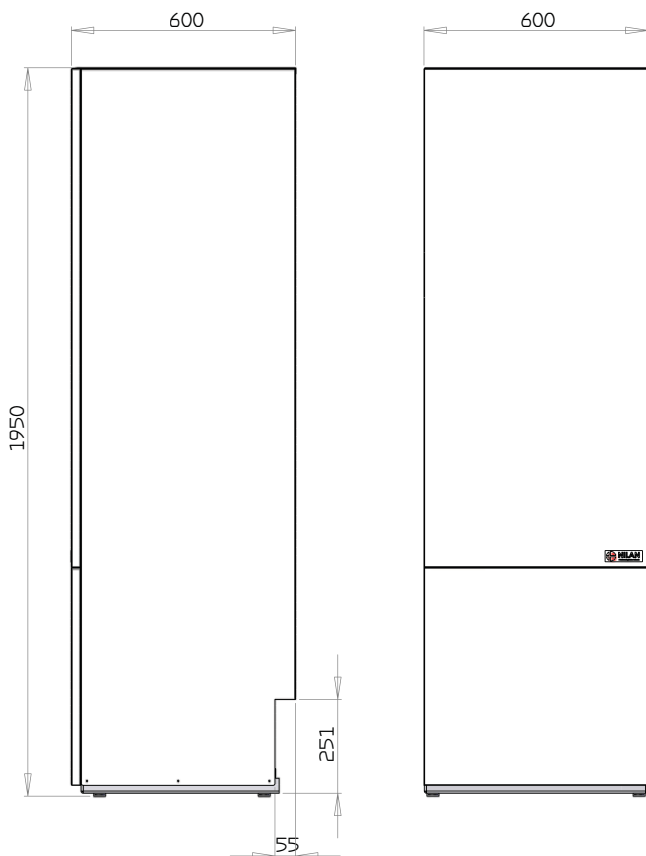
The heat pump is used to pre-heat the domestic hot water in the SHW tank to 30-45 °C (via a 3-way valve temperature sensor in the top of the SHW and the CTS 700 control).

The hot water is led in series through the SHW tank and Compact P 180-litre tank. This solution makes it possible to produce domestic hot water, since surplus heat from a heat pump and/or any solar heating system is accumulated in the tanks.

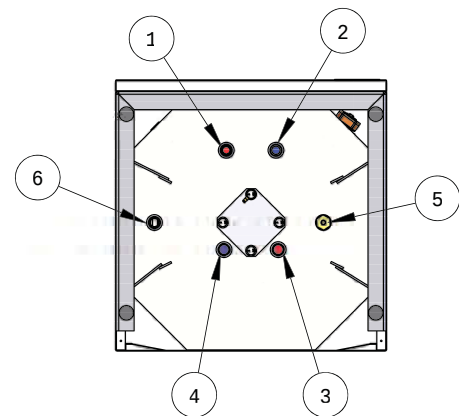
The SHW tank is prepared for the installation of a temperature sensor for external control of solar heating. The sun coil is intended for solar heating systems with solar collectors of approx. 4 m². The tank's foam insulation ensures minimum heat loss from the tank.



Dimensional drawing, SHW-tank

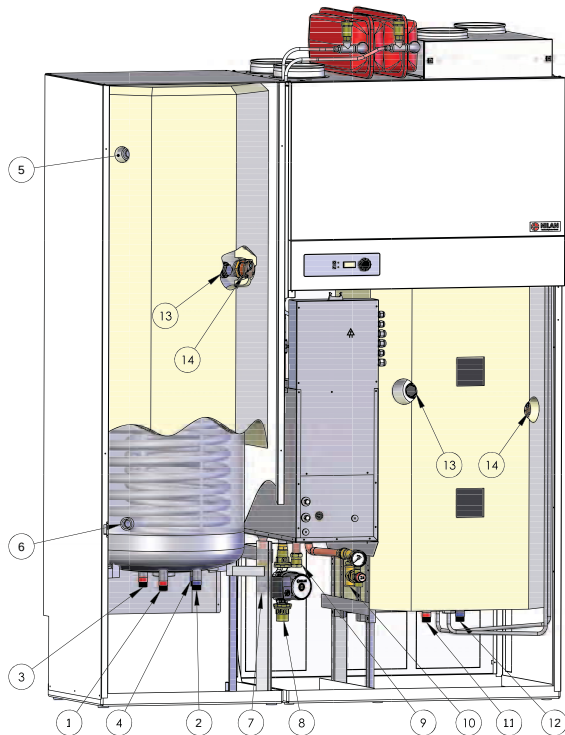


Bund



1. Hot water 3/4"
2. Cold water 3/4"
3. Flow, solar coil 3/4"
4. Return flow, solar coil 3/4"
5. Sensor pouch
6. Connector for hot water circulation 3/4"
7. Flow, GEO/AIR-coil 3/4"
8. Return flow, GEO/AIR-coil 3/4"

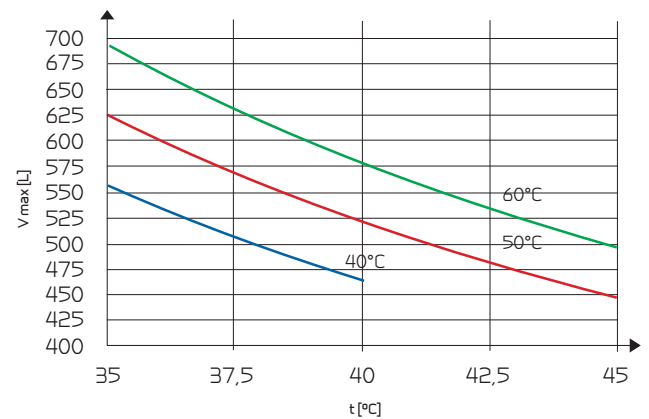
All dimensions are in mm



1. Hot water 3/4"
2. Cold water 3/4"
3. Flow, solar coil 3/4"
4. Return flow, solar coil 3/4"
5. Flow, GEO coil 3/4"
6. Return flow, GEO coil 3/4"
7. Flow, central heating 3/4"
8. Flow, brine 1"
9. Return flow, central heating 3/4"
10. Return flow, brine 1"
11. Hot water Compact 3/4"
12. Cold water Compact 3/4"
13. Anode 5/4"
14. Supplementary heating element 5/4"

Tapped water

The maximum tapping volume $V_{\max}$ [L] from Compact P GEO 6 SHW as a function of tapping temperature t [°C] and tank temperature Compact Pat 40, 50 and 60°C. Tank temperature SHW is 45°C.



COMPACT P EK

Product description

The Compact P EK unit has a built-in electrical boiler that can be connected to a waterborne central heating system, thereby providing electrical heating to the home.

The advantage of Compact P EK is that it does not require buried geothermal coils, or the installation of an air extraction heat pump, which is the case for traditional heat-pump based heating solutions. This makes installation easier and less expensive.

Electrical heating is a good solution for very well-insulated homes that do not use a lot of energy for heating, such as passive buildings. However, it must be checked whether electrical heating is legally permitted.

Compact P EK 3 kW

Heat output	3 kW
Supply voltage	230V / 3 x 230V / 3 x 400V
Max. fuse size (1 x 230 V)	16A
Max. fuse size (3 x 230 V)	13A
Max. fuse size (3 x 400V)	13A
Weight	21 kg
Standby electricity consumption	2 W
Expansion vessel	10 l

Compact P EK 6 kW

Heat output	6 kW
Supply voltage	230V / 3 x 230V / 3 x 400V
Max. fuse size (1 x 230 V)	32A
Max. fuse size (3 x 230 V)	13A
Max. fuse size (3 x 400 V)	13A
Weight	21 kg
Standby electricity consumption	2W
Expansion vessel	10 l

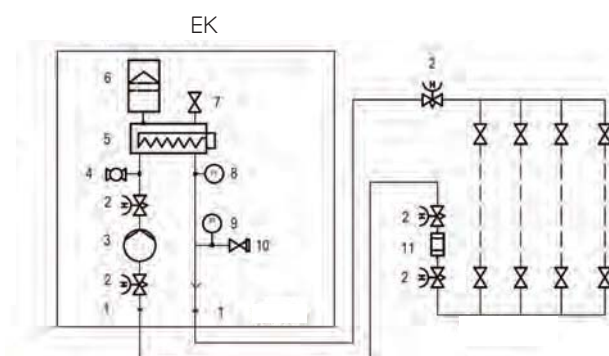
Functional diagram

- 1 Connection 3/4"
- 2 Stop valve
- 3 Circulation pump
- 4 Fill valve 1/2"
- 5 Electrical kettle with electrical heating element
- 6 Pressure expansion vessel
- 7 Automatic vent
- 8 Temperature sensor
- 9 Manometer
- 10 Safety valve 2,5 bar
- 11 Particulate filter



Compact P EK 9 kW

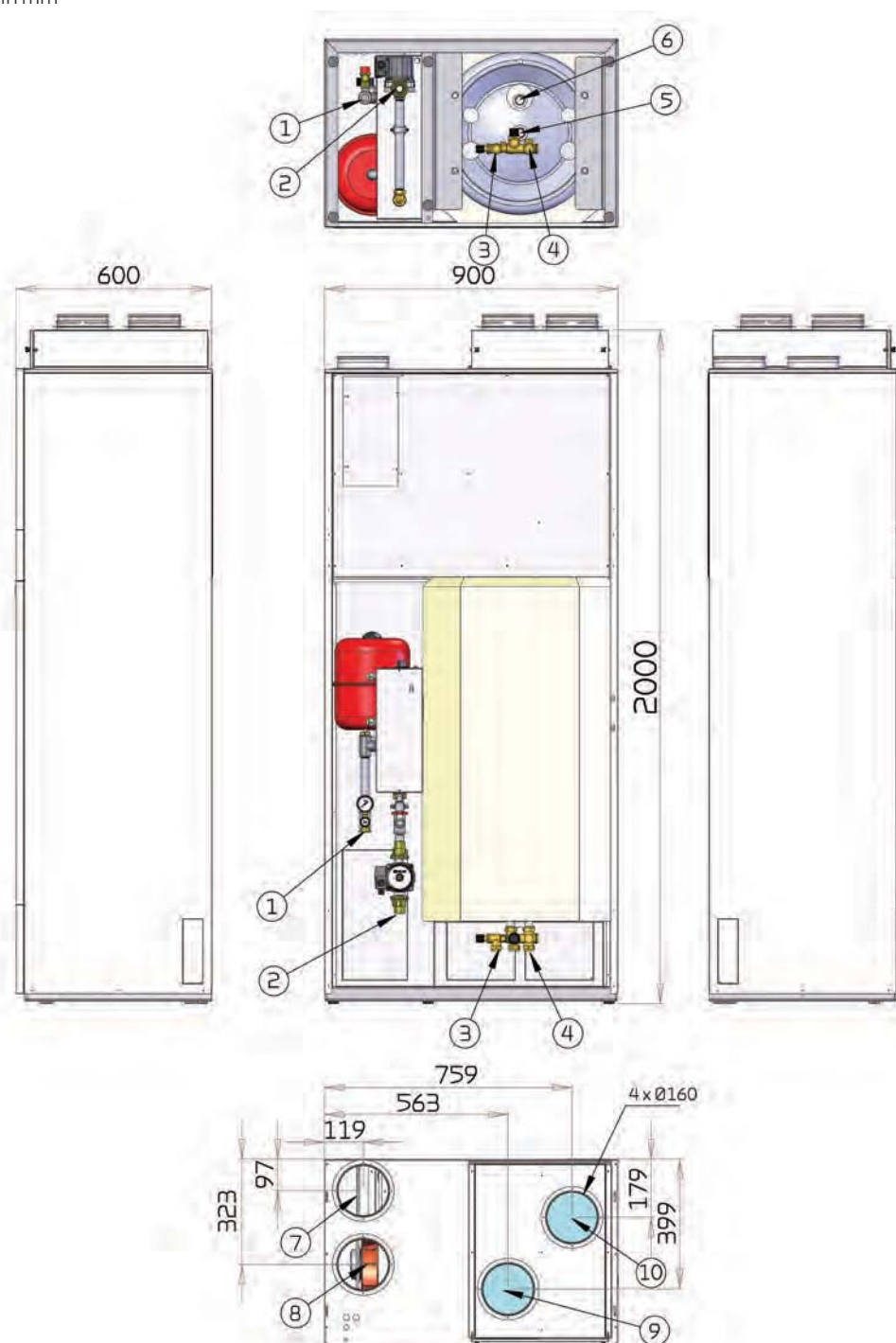
Heat output	9 kW
Supply voltage	3 x 230V / 3 x 400V
Max. fuse size (3 x 230 V)	16A
Max. fuse size (3 x 400 V)	16A
Weight	21 kg
Standby electricity consumption	2W
Expansion vessel	10 l



Product description

- 1 Flow from electrical kettle 3/4"
- 2 Return flow electrical kettle 3/4"
- 3 Cold water intake 3/4"
- 4 Hot water outlet 3/4"
- 5 Sensor pouch 3/4"
- 6 Connection for circulation pipe 3/4"
- 7 Discharge air
- 8 Supply air
- 9 Outdoor air
- 10 Extract air

All dimensions are in mm



TECHNICAL PARAMETERS EK

Boiler system for space heating

Model	EK 3 kW
Condensing boiler	No
Low temperature boiler	No
B1 boiler	No
Cogeneration space heater	No
Combination heater	No



Item	Symbol	Value	Unit
Rated heat output	P_{rated}	2,914	kW

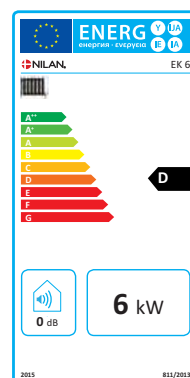
At rated heat output and high-temperature regime	P_4	2,914	kW
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Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η_s	39	%

At rated heat output and high-temperature regime	η_4	39	%
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Other items			
Standby heat loss	P_{stby}	0,0864	kW

Model	EK 6 kW
Condensing boiler	No
Low temperature boiler	No
B1 boiler	No
Cogeneration space heater	No
Combination heater	No



Item	Symbol	Value	Unit
Rated heat output	P_{rated}	5,914	kW

At rated heat output and high-temperature regime	P_4	5,914	kW
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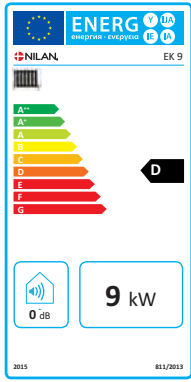
Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η_s	39	%

At rated heat output and high-temperature regime	η_4	39	%
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Other items			
Standby heat loss	P_{stby}	0,0864	kW

Model	EK 9 kW
Condensing boiler	No
Low temperature boiler	No
B1 boiler	No
Cogeneration space heater	No
Combination heater	No

Item	Symbol	Value	Unit
Rated heat output	P_{rated}	8,914	kW
At rated heat output and high-temperature regime	P_{q_i}	8,914	kW



Item	Symbol	Value	Unit
Seasonal space heating energy efficiency	η_s	40	%
At rated heat output and high-temperature regime	η_{q_i}	40	%
Other items			
Standby heat loss	P_{stby}	0,0864	kW

INFORMATION FROM A TO Z

Nilan develops and manufactures premium-quality, energy-saving ventilation and heat pump solutions that provide a healthy indoor climate and low-level energy consumption with the greatest consideration for the environment. In order to facilitate each step in the construction process - from choosing the solution through to planning, installation and maintenance - we have created a series of information material which is available for download at www.nilan.dk.



Brochure

General information about the solution and its benefits.



Product data

Technical information to ensure correct choice of solution.



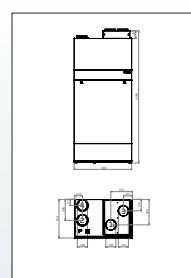
Installation instructions

Detailed guide for installation and initial adjustment of the solution.



User manual

Detailed guide for regulation of the solution to ensure optimum day-to-day operation.



Drawings

Tender documents and 3D drawings are available to download for planning purposes.

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Appendix 6

