

Table 4a: Heating system seasonal efficiency (space and water)

1. The table shows space heating efficiency. The same efficiency applies for water heating when hot water is supplied from a boiler system.
2. For independent water heaters see section at the end of table.
3. 'Heating type' refers to the appropriate column in Table 8.
4. 'Responsiveness (R)' is used to calculate entry in box (72) of worksheet.
5. Systems marked rd are part of the reduced data SAP data set (see S10 in Appendix S)
6. Heating systems, heating controls and fuels are assigned a code for data transfer purposes

	Efficiency %	Heating type	Respon- siveness (R)	Code	Rd SAP
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CENTRAL HEATING SYSTEMS WITH RADIATORS OR UNDERFLOOR HEATING

Gas boilers and oil boilers

For efficiency, use boiler database (www.boilers.org.uk) if possible, otherwise use efficiency from Table 4b.

Use Table 4c for efficiency adjustments.

Use Table 4d for heating type and responsiveness.

Refer to Group 1 in Table 4e for control options and temperature adjustments due to control.

Micro-cogeneration (micro-CHP)

See Appendix N. Performance data to be obtained from boiler database (www.boilers.org.uk).

Use Table 4c for efficiency adjustments.

Refer to Group 1 in Table 4e for control options and temperature adjustments due to control.

Solid fuel boilers

For efficiency, use boiler database if possible, otherwise use efficiency from this table. Column (A) gives minimum values for HETAS approved appliances, use column (B) for other appliances (see section 9.2.3). For open fires with back boilers and closed roomheaters with boilers the efficiencies are the sum of heat to water and heat to room. See Table 12b for fuel options.

Refer to Group 1 in Table 4e for control options

	(A)	(B)				
Manual feed boiler in heated space ^{a)}	65	60	2	0.75	151	rd
Manual feed boiler in unheated space ^{a)}	60	55	2	0.75	152	
Auto (gravity) feed boiler in heated space ^{a)}	70	65	2	0.75	153	
Auto (gravity) feed boiler in unheated space ^{a)}	65	60	2	0.75	154	rd
Wood chip/pellet independent boiler	67	65	2	0.75	155	
Open fire with back boiler to radiators, trapezium grate	63	55	3	0.50	156	rd
Open fire with back boiler to radiators, rectangular grate	65	55	3	0.50	157	
Closed roomheater with boiler to radiators	67	65	3	0.50	158	rd
Stove (pellet-fired) with boiler to radiators	67	65	2	0.75	159	
Range cooker boiler (integral oven and boiler)	50	45	3	0.50	160	rd
Range cooker boiler (independent oven and boiler)	60	55	3	0.50	161	

^{a)} Heated space means within the boundary of the dwelling as defined in section 1, "Dwelling dimensions"

Electric boilers

Refer to Group 1 in Table 4e for control options

Direct acting electric boiler	100		1	1.0	191	rd
Electric CPSU in heated space ^{a)}	100		2	0.75	192	rd
Electric dry core storage boiler in heated space ^{a) b)}	100		2	0.75	193	rd
Electric dry core storage boiler in unheated space ^{a) b)}	85		2	0.75	194	
Electric water storage boiler in heated space ^{a) b)}	100		2	0.75	195	rd
Electric water storage boiler in unheated space ^{a) b)}	85		2	0.75	196	

	Efficiency %	Heating type	Respon- siveness (R)	Code	Rd SAP
Heat pumps (see also warm air systems)					
<i>Refer to Group 2 in Table 4e for control options</i>					
Ground-to-water heat pump (electric)	320	From Table 4d		201	rd
Ground-to-water heat pump with auxiliary heater (electric)	300	From Table 4d		202	rd
Water-to-water heat pump (electric)	300	From Table 4d		203	rd
Air-to-water heat pump (electric)	250	From Table 4d		204	rd
Gas-fired, ground source	120	From Table 4d		205	
Gas-fired, water source	120	From Table 4d		206	
Gas-fired, air source	110	From Table 4d		207	
COMMUNITY HEATING SCHEMES					
<i>For calculation of SAP rating: efficiency is 100% reduced by the amount in the "efficiency adjustment" column of Table 4c.</i>					
<i>For calculation of CO₂ emissions: if known, use manufacturer's declared efficiency instead of value from this table.</i>					
<i>Refer to Group 3 in Table 4e for control options.</i>					
<i>Check Table 4c for efficiency adjustment due to controls.</i>					
<i>Allow for distribution loss (see Table 12c).</i>					
Community boilers only	75	1	1.0	301	rd
Community CHP and boilers	75	1	1.0	302	rd
Community waste heat from power station and boilers	75	1	1.0	303	
Community heat pump	300	1	1.0	304	
Community geothermal heat source and boilers	75	1	1.0	305	
ELECTRIC STORAGE SYSTEMS					
<i>Refer to Group 4 in Table 4e for control options.</i>					
<i>Off-peak tariffs:</i>					
Old (large volume) storage heaters	100	5	0.0	401	rd
Modern (slimline) storage heaters	100	4	0.25	402	rd
Convactor storage heaters	100	4	0.25	403	
Fan storage heaters	100	3	0.5	404	rd
Modern (slimline) storage heaters with Celect-type control	100	3	0.5	405	
Convactor storage heaters with Celect-type control	100	3	0.5	406	
Fan storage heaters with Celect-type control	100	2	0.75	407	
Integrated storage/direct acting heater	100	2	0.75	408	rd
<i>24-hour heating tariff:</i>					
Modern (slimline) storage heaters	100	3	0.5	402	
Convactor storage heaters	100	3	0.5	403	
Fan storage heaters	100	3	0.5	404	
Modern (slimline) storage heaters with Celect-type control	100	2	0.75	405	
Convactor storage heaters with Celect-type control	100	2	0.75	406	
Fan storage heaters with Celect-type control	100	2	0.75	407	
ELECTRIC UNDERFLOOR HEATING					
<i>Refer to Group 7 in Table 4e for control options.</i>					
<i>Off-peak tariffs:</i>					
In concrete slab (off-peak only)	100	5	0.0	421	rd
Integrated (storage/direct acting)	100	4	0.25	422	rd
Integrated (storage/direct acting) with low (off-peak) tariff control	100	3	0.50	423	

	Efficiency %	Heating type	Respon- siveness (R)	Code	Rd SAP
<i>Standard tariff:</i>					
In thin screed (45-60 mm)	100	2	0.75	424	rd
In timber floor	100	1	1	425	
WARM AIR SYSTEMS					
<i>Refer to Group 5 in Table 4e for control options.</i>					
Gas-fired warm air with fan-assisted flue					
Ducted, on-off control, pre 1998	70	1	1.0	501	
Ducted, on-off control, 1998 or later	76	1	1.0	502	rd
Ducted, modulating control, pre 1998	72	1	1.0	503	
Ducted, modulating control, 1998 or later	78	1	1.0	504	
Roomheater with in-floor ducts	69	1	1.0	505	
Gas fired warm air with balanced or open flue					
Ducted or stub-ducted, on-off control, pre 1998	70	1	1.0	506	rd
Ducted or stub-ducted, on-off control, 1998 or later	76	1	1.0	507	
Ducted or stub-ducted, modulating control, pre 1998	72	1	1.0	508	
Ducted or stub-ducted, modulating control, 1998 or later	78	1	1.0	509	
Ducted or stub-ducted with flue heat recovery	85	1	1.0	510	rd
Condensing	81	1	1.0	511	rd
Oil-fired warm air					
Ducted output (on/off control)	70	1	1.0	512	rd
Ducted output (modulating control)	72	1	1.0	513	
Stub duct system	70	1	1.0	514	
Electric warm air					
Electricaire system	100	2	0.75	515	rd
Heat pumps					
<i>Refer to Group 2 in Table 4e for control options.</i>					
Ground-to-air heat pump (electric)	320	1	1.0	521	rd
Ground-to-air heat pump with auxiliary heater (electric)	300	1	1.0	522	rd
Water-to-air heat pump (electric)	300	1	1.0	523	rd
Air-to-air heat pump (electric)	250	1	1.0	524	rd
Gas-fired, ground source	120	1	1.0	525	
Gas-fired, water source	120	1	1.0	526	
Gas-fired, air source	110	1	1.0	527	
ROOM HEATERS					
<i>Refer to Group 6 in Table 4e for control options.</i>					
<i>If declared efficiency is available (see Appendix E) use instead of value from table.</i>					
<i>The normal flue type is indicated as OF (open), BF (balanced) or C (chimney)</i>					
Gas (including LPG) room heaters:					
	Flue				
Gas fire, open flue, pre-1980 (open fronted)	OF	50	1	1.0	601
Gas fire, open flue, pre-1980 (open fronted), with back boiler unit	OF	50	1	1.0	602
Gas fire, open flue, 1980 or later (open fronted), sitting proud of, and sealed to, fireplace opening	OF	63	1	1.0	603
Gas fire, open flue, 1980 or later (open fronted), sitting proud of, and sealed to, fireplace opening, with back boiler unit	OF	63	1	1.0	604

		Efficiency %	Heating type	Respon- siveness (R)	Code	Rd SAP
Flush fitting Live Fuel Effect gas fire (open fronted), sealed to fireplace opening	OF	40	1	1.0	605	rd
Flush fitting Live Fuel Effect gas fire (open fronted), sealed to fireplace opening, with back boiler unit	OF	40	1	1.0	606	rd
Flush fitting Live Fuel Effect gas fire (open fronted), fan assisted, sealed to fireplace opening	OF	45	1	1.0	607	rd
Gas fire or wall heater, balanced flue	BF	58	1	1.0	609	rd
Gas fire, closed fronted, fan assisted	BF	72	1	1.0	610	rd
Condensing gas fire	BF	85	1	1.0	611	rd
Decorative Fuel Effect gas fire, open to chimney	C	20	1	1.0	612	rd
Flueless gas fire, secondary heating only (add additional ventilation requirements in box (9a))	none	90	1	1.0	613	rd
Oil room heaters:						
	Flue					
Room heater, pre 2000	OF	55	1	1.0	621	rd
Room heater, pre 2000, with boiler (no radiators)	OF	65	1	1.0	622	rd
Room heater, 2000 or later	OF	60	1	1.0	623	rd
Room heater, 2000 or later with boiler (no radiators)	OF	70	1	1.0	624	rd
Solid fuel room heaters						
<i>Column (A) gives minimum values for HETAS approved appliances, use column (B) for other appliances (see section 9.2.3).</i>						
	Flue	(A)	(B)			
Open fire in grate	C	37	32	3	0.50	631 rd
Open fire with back boiler (no radiators)	C	50	50	3	0.50	632 rd
Closed room heater	OF	65	60	3	0.50	633 rd
Closed room heater with boiler (no radiators)	OF	67	65	3	0.50	634 rd
Stove (pellet fired)	OF	67	65	2	0.75	635
Electric (direct acting) room heaters:						
Panel, convector or radiant heaters		100	1	1.0	691	rd
Fan heaters		100	1	1.0	692	rd
Portable electric heaters		100	1	1.0	693	rd
OTHER SPACE HEATING SYSTEMS						
<i>Refer to Group 7 in Table 4e for control options.</i>						
Electric ceiling heating		100	2	0.75	701	rd
HOT WATER SYSTEMS						
<i>If water heating from main system or secondary heater, use efficiency of main system or secondary heater except for those marked *.</i>						
From main heating system		efficiency of main system			901	rd
From secondary heater		efficiency of secondary heater			902	rd
Electric immersion (on-peak or off-peak)		100		n/a	903	rd
*Back boiler (hot water only), gas		65		n/a	904	rd
*From a circulator built into a gas warm air system, pre 1998		65		n/a	905	rd
*From a circulator built into a gas warm air system, 1998 or later		73		n/a	906	rd
Single-point gas water heater (instantaneous at point of use)		70		n/a	907	rd
Multi-point gas water heater (instantaneous serving several taps)		65		n/a	908	rd
Electric instantaneous at point of use		100		n/a	909	rd

Table 4b: Seasonal efficiency for gas and oil boilers

1. This table is to be used only for gas and oil boilers which cannot be located in the database.
2. The table shows seasonal efficiencies for space heating. The same seasonal efficiencies should be assumed for water heating when hot water is supplied from a boiler system.
3. See Appendix B for guidance on boiler classification.
4. Apply efficiency adjustments in Table 4c if appropriate.
5. See Table 4d for heating type and responsiveness.
6. Systems marked rd are part of the reduced data SAP data set (see S10 in Appendix S)

Boiler	Efficiency, %	Code	Rd SAP
Gas boilers (including LPG) 1998 or later			
Regular non-condensing with automatic ignition	73	101	rd
Regular condensing with automatic ignition	83	102	rd
Non-condensing combi with automatic ignition	73	103	rd
Condensing combi with automatic ignition	83	104	rd
Regular non-condensing with permanent pilot light	69	105	rd
Regular condensing with permanent pilot light	79	106	
Non-condensing combi with permanent pilot light	69	107	rd
Condensing combi with permanent pilot light	79	108	
Back boiler to radiators	65	109	rd
Gas boilers (including LPG) pre-1998, with fan-assisted flue			
Low thermal capacity	72	110	
High or unknown thermal capacity	68	111	rd
Combi	70	112	rd
Condensing combi	83	113	rd
Condensing	83	114	rd
Gas boilers (including LPG) pre-1998, with balanced or open flue			
Wall mounted	65	115	rd
Floor mounted, pre 1979	55	116	rd
Floor mounted, 1979 to 1997	65	117	rd
Combi	65	118	rd
Back boiler to radiators	65	119	rd
Combined Primary Storage Units (CPSU) (mains gas and LPG)			
With automatic ignition (non-condensing)	74	120	rd
With automatic ignition (condensing)	83	121	rd
With permanent pilot (non-condensing)	70	122	
With permanent pilot (condensing)	79	123	
Oil boilers			
Standard oil boiler pre-1985	65	124	
Standard oil boiler 1985 to 1997	70	125	rd
Standard oil boiler, 1998 or later	79	126	rd
Condensing	83	127	rd
Combi, pre-1998	70	128	rd
Combi, 1998 or later	76	129	rd
Condensing combi	81	130	rd
Oil room heater with boiler to radiators, pre 2000	65	131	rd
Oil room heater with boiler to radiators, 2000 or later	70	132	rd
Range cooker boilers (mains gas and LPG)			
Single burner with permanent pilot	46	133	rd
Single burner with automatic ignition	50	134	rd
Twin burner with permanent pilot (non-condensing) pre 1998	60	135	
Twin burner with automatic ignition (non-condensing) pre 1998	65	136	rd
Twin burner with permanent pilot (non-condensing) 1998 or later	65	137	

Twin burner with automatic ignition (non-condensing) 1998 or later	70	138	
Range cooker boilers (oil)			
Single burner	60	139	rd
Twin burner (non-condensing) pre 1998	70	140	rd
Twin burner (non-condensing) 1998 or later	75	141	

Table 4e: Heating system controls

1. Use Table 4a to select appropriate Group in this table.
2. 'Control' indicates the appropriate column to use in Table 9.
3. The 'Temperature adjustment' modifies the living area mean internal temperature obtained from Table 8 and should be entered into box (71) of the worksheet.

Type of control	Control	Temperature adjustment, °C	Reference to other possible adjustments	Code	rd SAP
GROUP 1: BOILER SYSTEMS WITH RADIATORS OR UNDERFLOOR HEATING					
No time or thermostatic control of room temperature	1	+0.6	Table 4c(2)	2101	rd
Programmer, no room thermostat	1	+0.6	Table 4c(2)	2102	rd
Room thermostat only	1	0	Table 4c(2)	2103	rd
Programmer and room thermostat	1	0	Table 4c(2)	2104	rd
Programmer and at least two room thermostats	2	0	Table 4c(2)	2105	rd
Programmer, room thermostat and TRVs	2	0	Table 4c(2)	2106	rd
Programmer, TRVs and bypass	2	0	Table 4c(2)	2107	rd
Programmer, TRVs and flow switch	2	0	Table 4c(2)	2108	
Programmer, TRVs and boiler energy manager	2	0	Table 4c(2)	2109	rd
Time and temperature zone control	3	0	Table 4c(2)	2110	rd
Adjustments for features of control systems: (applicable to any control option above and in addition to the adjustments selected above)					
Delayed start thermostat	one of the above	-0.15	n/a		
Load or weather compensation	one of the above	0	Table 4c(1)		
Temperature control of water heating (cylinderstat)	n/a	n/a	Tables 2b and 3		rd
Time control of water heating (separate programming)	n/a	n/a	Table 2b		
Adjustments for features other than controls:					
Temperature adjustment for CPSU or integrated thermal store	n/a	-0.1	n/a		rd
Underfloor heating	n/a	n/a	Table 4c(1)		rd
GROUP 2: HEAT PUMPS					
No time or thermostatic control of room temperature	1	+0.3	Table 4c(4)	2201	rd
Programmer, no room thermostat	1	+0.3	Table 4c(4)	2202	rd
Room thermostat only	1	0	Table 4c(4)	2203	rd
Programmer and room thermostat	1	0	Table 4c(4)	2204	rd
Programmer and at least two room thermostats	2	0	Table 4c(4)	2205	rd
Programmer, TRVs and bypass	2	0	Table 4c(4)	2206	rd
Time and temperature zone control	3	0	Table 4c(4)	2207	rd
Adjustments for features of control systems: (applicable to any control option above and in addition to the adjustments selected above)					
Load or weather compensation	one of the above	0	Table 4c(4)		
Temperature control of water heating (cylinderstat)	n/a	n/a	Tables 2b and 3		rd
Time control of water heating (separate programming)	n/a	n/a	Table 2b		

Table 4e continued

Type of control	Control	Temperature adjustment, °C	Reference to other possible adjustments	Code	Rd SAP
GROUP 3: COMMUNITY HEATING SCHEMES					
Flat rate charging*, no thermostatic control of room temperature	1	+0.3	Table 4c(3)	2301	rd
Flat rate charging*, programmer, no room thermostat	1	+0.3	Table 4c(3)	2302	
Flat rate charging*, room thermostat only	1	0	Table 4c(3)	2303	
Flat rate charging*, programmer and room thermostat	1	0	Table 4c(3)	2304	rd
Flat rate charging*, programmer and TRVs	2	0	Table 4c(3)	2305	rd
Charging system linked to use of community heating, programmer and TRVs	3	0	Table 4c(3)	2306	
* 'Flat rate charging' means that households pay for the heat according to a fixed monthly or annual amount, not depending on the amount of heat actually used. If the charges vary within a scheme for other reasons, for example according to dwelling size, it is still classified as flat rate. The last entry refers to a system in which the charges are substantially related to the amount of heat used.					
GROUP 4: ELECTRIC STORAGE SYSTEMS					
Manual charge control	3	+0.3	n/a	2401	rd
Automatic charge control	3	0	n/a	2402	rd
Celect-type controls	3	0	n/a	2403	
GROUP 5: WARM AIR SYSTEMS					
No thermostatic control of room temperature	1	+0.3	n/a	2501	rd
Programmer, no room thermostat	1	+0.3	n/a	2502	
Room thermostat only	1	0	n/a	2503	rd
Programmer and room thermostat	1	0	n/a	2504	rd
Programmer and at least two room thermostats	2	0	n/a	2505	
Time and temperature zone control	3	0	n/a	2506	rd
GROUP 6: ROOM HEATER SYSTEMS					
No thermostatic control of room temperature	2	+0.3	n/a	2601	rd
Appliance thermostats	3	0	n/a	2602	rd
Programmer and appliance thermostats	3	0	n/a	2603	rd
Room thermostats only	3	0	n/a	2604	rd
Programmer and room thermostats	3	0	n/a	2605	rd
GROUP 7: OTHER SYSTEMS					
No thermostatic control of room temperature	1	+0.3	n/a	2701	rd
Programmer, no room thermostat	1	+0.3	n/a	2702	
Room thermostat only	1	0	n/a	2703	rd
Programmer and room thermostat	1	0	n/a	2704	rd
Temperature zone control	2	0	n/a	2705	rd
Time and temperature zone control	3	0	n/a	2706	rd

Table 12: Fuel prices, additional standing charges, emission factors and primary energy factors

Fuel	Additional standing charge, £ ^(a)	Unit price p/kWh	Emissions kg CO ₂ per kWh	Primary energy factor	Fuel code
Gas:					
mains gas	34	1.63	0.194	1.15	1
bulk LPG	62	3.71	0.234	1.10	2
bottled LPG		4.32	0.234	1.10	3
Oil:					
heating oil		2.17	0.265	1.19	4
Solid fuel:^(b)					
house coal		1.91	0.291	1.07	11
anthracite		1.99	0.317	1.07	15
manufactured smokeless fuel		2.67	0.392	1.30	12
wood logs		2.20	0.025	1.10	20
wood pellets (in bags, for secondary heating)		5.00	0.025	1.10	22
wood pellets (bulk supply in bags, for main heating)		3.00	0.025	1.10	23
wood chips		1.60	0.025	1.10	21
dual fuel appliance (mineral and wood)		2.10	0.187	1.10	10
Electricity:					
standard tariff		7.12	0.422	2.8	30
7-hour tariff (on-peak) ^(c)		7.65	0.422	2.8	32
7-hour tariff (off-peak) ^(c)	20	2.94	0.422	2.8	31
10-hour tariff (on-peak) ^(c)		7.83	0.422	2.8	34
10-hour tariff (off-peak) ^(c)	17	4.29	0.422	2.8	33
24-hour heating tariff	51	4.09	0.422	2.8	35
electricity sold to grid		5.70 ^(d)			36
electricity displaced from grid			0.568 ^(d)	2.8 ^(d)	37
electricity, unspecified tariff					39
Community heating schemes:					
heat from boilers – gas, oil, solid fuel	34	1.99	as above ^(e)	as above ^(e)	as above ^(e)
heat from heat pump		1.99	as above ^(e)	as above ^(e)	41
heat from boilers – waste combustion		1.99	0.057	1.10	42
heat from boilers – biomass		1.99	0.025	1.10	43
heat from boilers – biogas		1.99	0.025	1.10	44
waste heat from power stations		1.39	0.018	1.05	45
geothermal heat source		1.39	0.018	1.05	46
heat from CHP		1.39	as above ^(e)	as above ^(e)	48
electricity generated by CHP			0.568 ^(d)	2.8 ^(d)	49

Energy Cost Deflator ^(f) = 0.91

Notes:

- (a) The standing charge given for electricity is extra amount for the off-peak tariffs, over and above the amount for the standard domestic tariff, as it is assumed that the dwelling has a supply of electricity for reasons other than space and water heating. Standing charges for gas and for off-peak electricity are added to space and water heating costs where those fuels are used for main heating or hot water.
- (b) The specific fuel should be assumed for those appliances that can only burn the particular fuel (including Exempted Appliances within Smoke Control Areas).
Where a main heating appliance is classed as dual fuel (i.e mineral and wood), the data for dual fuel should be used, except where the dwelling is in a Smoke Control Area, when the data for solid mineral fuel should be used.
Wood should be specified as fuel for a main heating system only if there is adequate provision (at least 1.5 m³) for storage of the fuel.

Outside Smoke Control Areas an open fire should be considered as dual fuel and a closed room heater without boiler as burning wood logs.

- (c) With certain appliances using an off-peak tariff, some of the consumption is at the off-peak rate and some at the on-peak rate. The on-peak percentages to be used are given in Table 12a, the remainder being provided at the off-peak rate.*
- (d) Deducted from costs, emissions or primary energy*
- (e) Take factor from further up the table according to fuel used.*
- (f) An energy cost deflator term is applied before the rating is calculated. It will vary with the weighted average price of heating fuels in future, in such a way as to ensure that the SAP is not affected by the general rate of inflation. However, individual SAP ratings are affected by relative changes in the price of particular heating fuels.*