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ANNEXES 1 to 10

ANNEXES

to the

Commission Delegated Regulation (EU) .../...

supplementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of space heaters, combination heaters, temperature controls, solar devices, shower water heat recovery devices and packages of those products, and repealing Commission Delegated Regulation (EU) No 811/2013

ANNEX I

Definitions applicable to Annexes II to IX

1. GENERIC DEFINITIONS

(1) ‘declared values’ means the values provided by the supplier for the stated, calculated or measured technical parameters, pursuant to Article 3(3) of Regulation (EU) 2017/1369 and in accordance with Article 3(1) point (d) and Annex VII of this Regulation, for the verification of compliance by the Member State authorities;

(2) ‘equivalent model’ means a model which has the same technical characteristics relevant for the technical information to be provided, and which is placed on the market or put into service by the same manufacturer, importer or authorised representative as another model with a different model identifier;

(3) ‘model identifier’ means the code, usually alphanumeric, which distinguishes a specific water heater, hot water storage tank from other models with the same trade mark, supplier’s name or dealer’s name;

(4) ‘nested display’ means a visual interface where an image or data set is accessed by a mouse click, mouse roll-over or tactile screen expansion of another image or data set;

(5) ‘tactile screen’ means a screen responding to touch, such as that of a tablet computer, slate computer or smartphone;

(6) ‘alternative text’ means text provided as an alternative to a graphic allowing information to be presented in non-graphical form where display devices cannot render the graphic or as an aid to accessibility, for example as an input to voice-synthesis applications;

(7) ‘energy-smart appliance’ means a product whose supplier is a signatory of the Code of Conduct on energy-management-related interoperability of energy-smart appliances, and for which the compliance with this Code of Conduct is documented in the product database set up and maintained by the Commission in accordance with Article 12 of Regulation (EU) 2017/1369;

2. DEFINITIONS RELATED TO HEATERS

(8) ‘conversion coefficient’ (*cc*) means the default coefficient referred to in Article 31(3) of Directive (EU) 2023/1791 of the European Parliament and of the Council ([1]) in the version in force on 10 October 2023;

(9) ‘seasonal space heating energy efficiency’ ($\eta_{s,h}$) means the ratio between the space-heating demand supplied by a heater and the annual energy consumption required to meet this demand, expressed in %;

(10) ‘standby mode’ means a condition where the heater is connected to the main power source and provides only the following functions, which may persist for an indefinite period of time;

([1]) Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (OJ L 231, 20.9.2023, p. 1, ELI http://data.europa.eu/eli/dir/2023/1791/oj).

(a) reactivation function, or reactivation function and only an indication of enabled reactivation function;

(b) reactivation function through a connection to a network (‘network standby’);

(c) information or status display;

(11) ‘active mode’ means a condition corresponding to the hours with a heating or cooling load for the enclosed space and activated heating or cooling function, which, for heat-pump heaters, may involve cycling of the heat-pump heater to reach or maintain a required indoor air temperature;

(12) ‘network’ means a network as defined in Article 2, point (9), of Commission Regulation (EU) 2023/826 ([2]);

(13) ‘reactivation function’ means a function that via a remote switch, a remote control, an internal sensor or timer provides a switch from standby mode to another mode, including active mode, providing additional functions;

(14) ‘standby mode power consumption’ (P_{SB}) means the electric power consumption of a heater in standby mode, including network standby, expressed in kW;

(15) ‘climate conditions’ means solar radiations during the heating season, or the temperature conditions during the heating season or during the cooling season, as expressed by the frequency, in hours, of the outdoor temperature bin values, rounded to the nearest integer, as provided for in Annex VII, Table 4;

(16) ‘average climate conditions’ in heating mode’ means the climate conditions characteristic for the city of Strasbourg;

(17) ‘colder climate conditions in heating mode’ means the climate conditions characteristic for the city of Helsinki;

(18) ‘warmer climate conditions’ in heating mode’ means the climate conditions characteristic for the cities of Athens;

(19) ‘average climate conditions in cooling mode’ means a weighted average distribution based on several European capital cities;

(20) ‘water-based heat distribution system’ means a system using water as a heat-transfer medium to distribute generated heat to heat emitters for the space heating of buildings, or parts thereof;

(21) ‘gross calorific value’ (*GCV*) means the total amount of heat released by a unit quantity of fuel when it is burned completely with oxygen and when the products of combustion are returned to ambient temperature; this quantity includes the condensation heat of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel;

(22) ‘control correction factor’ (F(1)) means a correction factor for a basic temperature control, subtracting 3 percentage points from the seasonal space-heating energy efficiency;

([2]) Commission Regulation (EU) 2023/826 of 17 April 2023 laying down ecodesign requirements for off mode, standby mode, and networked standby energy consumption of electrical and electronic household and office equipment pursuant to Directive 2009/125/EC of the European Parliament and of the Council and repealing Commission Regulations (EC) No 1275/2008 and (EC) No 107/2009 (OJ L 103, 18.4.2023, p. 29, ELI: http://data.europa.eu/eli/reg/2023/826/oj).

(23) ‘auxiliary electricity correction factor’ (F(2)) means the factor equal to the electric auxiliary consumption of the heater as a fraction of the total annual energy consumption of the heater, expressed in percentage points;

(24) ‘auxiliary electricity consumption’ means the annual amount of electricity consumed by the heater components such as the fan, the valves, and the heating elements required for the heat generator designated operation, but not the circulation pump, expressed in kWh/a;

(25) ‘seasonal space heating energy efficiency in active mode’ (η_{son}) means the seasonal space-heating energy efficiency during the hours with a space-heating load, whereby the heating function of the heater is activated, possibly involving on/off cycling of the heater to reach or maintain a required instantaneous heat load;

(26) ‘heat output’ (P) means the heat produced by a heater which is transmitted to the water-based heat distribution system, expressed in kW;

(27) ‘sound power level’ (LWA) means the A-weighted sound-power level, indoors and/or outdoors, expressed in dB, as set out in Annex VII, Section 7;

3. DEFINITIONS RELATED TO FUEL AND ELECTRIC BOILER HEATERS, AND COGENERATION HEATERS

(28) ‘B1 boiler heater’ means a fuel boiler heater incorporating a draught diverter, intended to be connected to a natural draught flue that evacuates the residues of combustion to the outside of the room containing the fuel boiler heater, and drawing the combustion air directly from the room;

(29) ‘condensing boiler heater’ means a fuel boiler heater in which, under normal operating conditions and at given operating water temperatures, the water vapour in the combustion products is partially condensed, to make use of the latent heat of this water vapour for heating purposes;

(30) ‘space heating efficiency’ (η) means:

(a) for fuel boiler heaters: the ratio of the heat output in kW and the heat input in kW in terms of the GCV of the fuel;

(b) for cogeneration heaters: the ratio between the sum of the heat output and of the electric output multiplied by the electricity conversion factor of 2.65 in kW, and the heat input in kW in terms of the GCV of the fuel;

(c) for electric boilers: the ratio of the heat output in kW and the electric input in kW;

(31) ‘standard rated heat input’ (P_{hs}) of a fuel boiler heater or cogeneration heater means the heat input consumed when the heater is providing its maximum heat output in a 60/80 temperature regime, in kW, in terms of GCV;

(32) ‘standard rated electric power input’ (EC) of an electric boiler heater is the electric power consumed at standard-rated heat output;

(33) ‘part load output’ (P_1) of a fuel boiler heater means the heat output at 30% of the standard rated heat input P_{hs} in a 30/50 temperature regime, expressed in kW;

(34) ‘30/50 temperature regime’ means the 30 °C inlet and 50 °C outlet temperature for water;

(35) ‘minimum part load output’ (P_0) of a fuel boiler heater means the heat output with the lowest thermal input declared by the supplier that can be achieved without on/off cycling in a 30/50 temperature regime, expressed in kW;

(36) ‘turndown ratio’ of a fuel boiler means the ratio between the lowest thermal input declared by the supplier that can be achieved without on/off cycling in a 30/50 temperature regime and P_{hs}, expressed in %;

(37) ‘nominal efficiency’ (η_4) of a fuel boiler heater, electric boiler heater or cogeneration heater means the efficiency at standard-rated heat output;

(38) ‘efficiency at 30 % input’ (η_1) means, for a fuel boiler heater, the space-heating efficiency at 30 % of the standard-rated heat input P_{hs};

(39) ‘efficiency at minimum heat input’ (η_0) of a fuel boiler heater means the ratio between minimum part-load output (P_0) and standard-rated heat input (P_{hs});

(40) ‘full load auxiliary power’ (el_{max}) means the electric power consumption, as part of the electric auxiliary energy, at standard-rated heat output P4 of a fuel boiler heater or cogeneration heater, expressed in kW;

(41) ‘part load auxiliary power’ (el_{min}) means the electric power consumption, as part of the electric auxiliary energy, at part load P_1 of a fuel boiler heater or cogeneration heater, expressed in kW;

(42) ‘standby heat loss’ ($P_{h,l}$) means the heat loss of a boiler heater in operating modes without heat demand, expressed in kW;

(43) ‘standby heat loss correction factor’ (F(3)) means a correction factor for the standby heat loss of boiler heaters and cogeneration heaters;

(44) ‘cogeneration electric power output’ (P_{el}) is the electric power output of a cogeneration heater operating at standard-rated heat output, expressed in kW;

(45) ‘cogeneration part efficiency’ (η_{CHP}) is the efficiency of the cogeneration heater when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime;

(46) ‘cogeneration part heat output’ (P_{CHP}) is the heat output of the cogeneration, when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime, expressed in kW;

(47) ‘cogeneration part electric power output’ (P_{el_CHP}) is the rated electric power output, when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime, expressed in kW;

(48) ‘cogeneration part heat input’ (P_{input_CHP}) is the heat-input power in GCV of the liquid-fuel or gaseous-fuel input of the cogeneration, when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime, expressed in kW;

4. DEFINITIONS RELATED TO HEAT-PUMP AND HYBRID HEAT-PUMP HEATERS

(49) ‘heat pump heater’ means a heater using a heat generator utilising a heat-pump cycle that captures ambient energy, geothermal energy and/or waste heat for heat generation; it can include a backup heater;

(50) ‘electric heat pump heater’ means a heat-pump heater, for which the operation of the heat generator is driven by electricity; it can include an electric backup heater;

(51) ‘electric backup heater’ means a backup heater that generates heat using the Joule effect in electric resistance heating elements;

(52) ‘fuel heat pump heater’ means a heat-pump heater, for which the operation of the heat generator is driven by fuel combustion; it can include a fuel backup heater;

(53) ‘hybrid heat pump heater’ means an encased assembly or assemblies designed as a unit consisting of:

(a) a hybrid master control (which optimizes the operation of two heat generators for space heating and possibly water heating;

(b) one heat generator that uses a heat pump cycle to capture ambient energy, geothermal energy and/or waste heat for heat generation;

(c) one heat generator that uses the combustion of gaseous or liquid fuels for heat generation;

(54) ‘standard rating conditions’ means the operating conditions of heaters under which they are tested to determine their standard-rated heat output, seasonal space-heating energy efficiency, water-heating energy efficiency, standard-rated cooling capacity, seasonal space-cooling energy efficiency, sound-power level and nitrogen oxide emissions;

(55) ‘fluorinated green-house gases’ means the fluorinated green-house gases in scope of Regulation (EU) 2024/573 of the European Parliament and of the Council ([3]);

(56) ‘operation limit temperature’ (TOL) means the outdoor temperature below which the declared electric heat-pump heater capacity or the capacity of the electric heat-pump heat generator of the heat pump or of the hybrid heat-pump heater is equal to zero, expressed in degrees Celsius, rounded up to the nearest higher integer value;

(57) ‘LT heat-pump heater’ means a heat-pump heater declared to be capable of being used in a low-temperature application, but not in a medium-temperature nor in a high-temperature application;

(58) ‘MT heat-pump heater’ means a heat-pump heater declared to be capable of being used in a medium-temperature application but not in a high-temperature application;

(59) ‘HT heat-pump heater’ means a heat-pump heater declared to be capable of being used in a high-temperature application;

(60) ‘low-temperature heating application’ means an application where the heat-pump heater delivers heating at an indoor heat-exchanger outlet temperature of 35 °C at design temperature, and at a specific water outlet temperature per part-load condition;

(61) ‘medium temperature heating application’ means an application where the heat-pump heater delivers heating at an indoor heat-exchanger outlet temperature of 55 °C at design temperature, and at a specific water outlet temperature per part-load condition;

(62) ‘high temperature heating application’ means an application where the heat-pump heater delivers heating at an indoor heat-exchanger outlet temperature of 65 °C at

([3]) Regulation (EU) 2024/573 of the European Parliament and of the Council of 7 February 2024 on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) No517/2014 (OJ L, 2024/573, 20.2.2024. ELI: http://data.europa.eu/eli/reg/2024/573/oj).

design temperature, and at a specific water outlet temperature per part-load condition;

(63) 'heat pump heat source' means the heat source or heat exchanger used at the evaporator side of a heat-pump heater or hybrid heat-pump heater: outdoor air, ventilation exhaust air ('exhaust air'), ground heat exchanger (brine or water), or ground direct exchange (refrigerant);

(64) 'reference design conditions' means the combination provided for in Annex VII, Table 1, of:

(a) for heat-pump heaters in heating mode: the reference design temperature, the maximum bivalent temperature, maximum operation limit temperature and, if the heat-pump heater uses exhaust air, the maximum availability of exhaust air volume rates at $P_{design,h}$;

(b) for hybrid heat-pump heaters in heating mode: the reference design temperature and, if the heat-pump heater uses exhaust air, the maximum availability of exhaust air volume rates at $P_{design,h}$;

(c) for cooling: the reference design temperature;

(65) 'reference design temperature' means the outdoor temperature for either cooling ($T_{design,c}$) or heating ($T_{design,h}$) as described in Annex VII, Table 1, at which the 'part load ratio' is equal to 1 and which varies according to the cooling or heating season, expressed in degrees Celsius;

(66) 'bivalent temperature' (T_{biv}) means the lowest outdoor temperature point at which the heat-pump heater is declared to have a capacity able to meet 100% of the heating load, expressed in degrees Celsius, rounded up to the nearest integer value;

(67) 'reference annual heating demand' (Q_H) means the reference heating demand for the heating season in a specific climate, to be used as the basis for calculating SCOP or SPER and calculated as the product of the design load for heating and the annual equivalent active-mode hours, expressed in kWh/a;

(68) 'annual equivalent active mode hours' (H_{HE}) means the assumed annual number of hours in a specific climate a heat-pump heater or hybrid heat-pump heater has to provide the design load for heating to satisfy the reference annual heating demand, expressed in hours (h), as set out in Annex VII, Table 2;

(69) 'annual energy consumption' (Q_{HE}) means the energy consumption required to meet the reference annual heating demand for a designated heating season, expressed in kWh in terms of GCV and/or in kWh in terms of the final electricity consumption multiplied by CC;

(70) 'heating season' means a set of operating conditions describing per bin the combination of outdoor temperatures and the number of hours these temperatures occur per season;

(71) 'bin' (bin j) means a combination of an outdoor temperature and several hours;

(72) 'outdoor temperature' (T_j) means the dry-bulb outdoor air temperature for bin j, expressed in degrees Celsius; the relative humidity may be indicated by a corresponding wet-bulb temperature;

(73) 'part load ratio' ($pl(T_j)$) means the outdoor temperature T_j minus 16 °C divided by the reference design temperature $T_{design,h}$ minus 16 °C;

(74) ‘bin hours’ (H_j) means the hours per heating or cooling season, expressed in hours per year, at which an outdoor temperature occurs for each bin;

(75) ‘part load for heating’ ($P_h(T_j)$) means the heating load at a specific outdoor temperature, calculated as the design load multiplied by the part-load ratio, expressed in kW;

(76) ‘part load conditions’ is the set of temperature conditions for testing at part loads A, B, C, D, E and F;

(77) ‘single speed heat-pump’ means a heat-pump for which the heat output (resp. cooling capacity) can only adapt to the heating (resp. cooling) needs by cycling the compressor on and off.

(78) ‘declared capacity for heating’ (P_{dh}) means the declared heating capacity a heat-pump heater can deliver for specific part-load conditions, in continuous operation, expressed in kW;

(79) ‘backup capacity’ (Padd(Tj)) is the difference between the part load for heating and the maximum heat output of the main generator, for an outdoor temperature T_j, expressed in kW;

(80) ‘backup energy input’ (INPUTadd(Tj)) is the energy input of the backup heater, for an outdoor temperature T_j, expressed in kW;

(81) ‘declared coefficient of performance’ ($COP_d(T_j)$) means the declared coefficient of performance at the designated bins at T_j of the part-load conditions;

(82) ‘fuel utilisation efficiency’ ($FUE_d(T_j)$) is the declared ratio between the part load $Ph(T_j)$ and the measured thermal input in terms of GCV at a specific outdoor temperature T_j, expressed in kW/kW;

(83) ‘auxiliary electricity factor’ (AEF(Tj)) is the ratio between the part load $P_h(Tj)$ and the electric power input at a specific outdoor temperature T_j, expressed in kW/kW;

(84) ‘capacity ratio’ (CR) is the part load for heating $P_h(T_j)$ divided by the declared heating capacity $P_{dh}(Tj)$ of the heater at the same temperature T_j condition;

(85) ‘cycling’ is the condition where the capacity ratio (CR) is smaller than 0,9 and the heat-pump heater will cycle on/off to reach the required part load $P_h(Tj)$;

(86) ‘degradation coefficient’ (C_{dh}) means the measure of efficiency loss due to cycling of heat-pump heaters; if C_{dh} is not determined by measurement then the default degradation coefficient is $C_{dh} = 0,9$;

(87) ‘adjusted outlet temperature for cycling’ ($T_{cyc}(T_j)$) means the average outlet temperature during cycling of a heat-pump heater;

(88) ‘bin-specific coefficient of performance’ ($COP_{bin}(T_j)$) means the coefficient of performance of the electric heat-pump heater, derived from the part load for heating, declared capacity for heating and declared coefficient of performance for specified bins, and calculated for other bins by interpolation or extrapolation, corrected where necessary by the degradation coefficient;

(89) ‘bin-specific primary energy ratio’ ($FUE(T_j)$) means the fuel-utilisation efficiency of the fuel heat-pump heater, derived from the part load for heating, declared capacity for heating and declared fuel-utilisation efficiency for specified bins and calculated for other bins by interpolation or extrapolation, corrected where necessary by the degradation coefficient;

(90) ‘active mode coefficient of performance’ (η) means the weighted average coefficient of performance of an electric heat-pump heater;

(91) ‘active mode seasonal fuel-utilisation efficiency’ (SFUE) means the seasonal FUE, calculated as the hour (h_j) weighted average of FUE(T_j) over the designated heating season, expressed in kW/kW;

(92) ‘active mode seasonal auxiliary electricity factor’ ($SAEF_{on}$) means the seasonal AEF in active mode, calculated as the hour (h_j) weighted average of AEF(T_j) over the designated heating season, expressed in kW/kW;

(93) (93) ‘seasonal auxiliary electricity factor’ (SAEF) means the seasonal AEF, including electricity use in non-active modes Q_{aux}, calculated as the reference annual heating demand divided by the annual energy consumption, expressed in kW/kW;

(94) (94) ‘seasonal coefficient of performance’ (SCOP) means the annual average coefficient of performance of an electric heat-pump heater in the designated heating season, calculated as the reference annual heating demand divided by the annual energy consumption;

(95) ‘seasonal coefficient of performance in active mode’ ($SCOP_{on}$) means the seasonal coefficient of performance, calculated as the hour (h_j) weighted average of COP(T_j) over the designated heating season, expressed in kW/kW;

(96) ‘seasonal primary energy ratio’ (SPER) means the annual average primary energy ratio of a fuel heat-pump space heater in the designated heating season, calculated from the SFUE and SAEF whereby the latter is converted to primary energy using CC;

(97) ‘hybrid heat pump heater electric resistance heat generator heat output’ (elbu(T_j)) means the heat output of an electric resistance heat generator supplementing the declared heat-pump capacity for heating to reach the part load for heating Ph(T_j) in the bin with temperature T_j, expressed in kW;

(98) ‘hybrid heat pump heater fuel heat generator capacity’ (fuelbu(T_j)) means the heat output of a fuel heat generator supplementing the declared heat-pump capacity for heating, as appropriate, to reach the part load for heating Ph(T_j) in the bin with temperature T_j, expressed in kW;

(99) ‘off mode’ means a condition in which the heat-pump heater is connected to the mains power source and is not providing any function, or it is in a condition providing only:

(a) an indication of its off-mode condition;

(b) functionalities intended to ensure electromagnetic compatibility pursuant to Directive 2014/30/EU of the European Parliament and of the Council([4]);

(100) ‘thermostat-off mode’ of a heat-pump heater or hybrid heat-pump heater means the condition corresponding to the hours with no heating load and activated heating function, whereby the heating function is switched on, but the heat-pump heater is not operational; cycling in active mode is not considered as thermostat-off mode;

([4]) Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (OJ L 96, 29/03/2014, p. 79’, ELI: http://data.europa.eu/eli/dir/2014/30/oj).

(101) ‘crankcase mode’ means the condition in which a crankcase heating device is activated to avoid the refrigerant migrating to the compressor to limit the refrigerant concentration in oil when the compressor is started;

(102) ‘off mode power consumption’ (P_{OFF}) means the power consumption of a heat-pump heater or hybrid heat-pump heater in off mode, expressed in kW;

(103) ‘thermostat-off mode power consumption’ (P_{TO}) means the power consumption of the heat-pump heater or hybrid heat-pump heater while in thermostat-off mode, expressed in kW;

(104) ‘crankcase mode power consumption’ (P_{CK}) means the power consumption of the heat-pump heater or hybrid heat-pump heater while in crankcase mode, expressed in kW;

(105) ‘hours in various operating modes’ are the number of annual hours in active mode (H_{HE}), thermostat-off mode (H_{TO}), standby mode (H_{SB}), off mode (H_{OFF}) and crankcase mode (H_{CK}) for reversible and heating-only heat-pump heaters;

(106) ‘off mode operating hours’ (H_{OFF}) means the annual number of hours [hrs/a] the unit is in off mode, the value of which depends on the designated season and function;

(107) ‘thermostat-off mode operating hours’ (H_{TO}) means the annual number of hours (hrs/a) the unit is in thermostat-off mode, the value of which depends on the designated season and function;

(108) ‘standby mode operating hours’ (H_{SB}) means the annual number of hours [hrs/a] the unit is in standby mode, the value of which depends on the designated season and function;

(109) ‘crankcase mode operating hours’ (H_{CK}) means the annual number of hours (hrs/a) the unit is in crankcase-heater-operation mode, the value of which depends on the designated season and function;

(110) ‘additional auxiliary electricity consumption’ (Q_{aux}) means the annual auxiliary electricity consumption of a heat-pump heater or of the heat pump heat generator of a hybrid heat-pump heater, in kWh/a, in thermostat-off mode, standby mode, off mode and crankcase-heater mode from measured power and default hours in each mode;

(111) ‘maximum ventilation exhaust air flow rate for space heating’ ($q_{v,maxh}$) means the maximum flow rate of exhaust air at temperature conditions that can be used when assessing space-heating efficiency;

(112) ‘switch temperature fuel boiler off’ ($T_{fb,off}$) for a hybrid heat-pump heater means the outdoor air temperature above which the fuel backup heater is not providing any heating capacity as it is switched off by the controls and heat is only provided by the heat-pump heat generator;

(113) ‘switch temperature heat pump on’ ($T_{hp,on}$) for a hybrid heat-pump heater means the outdoor air temperature above which the heat-pump heat generator is switched on;

(114) ‘test conditions’ means the test conditions defined in Annex VII, Table 3;

(115) ‘frequency’ in Hz means the number of rotations per second of the compressor, or of the circulator, or of the fan, or of the engine of the heater;

5. DEFINITIONS RELATED TO THE COOLING FUNCTION IN REVERSIBLE HEAT-PUMP HEATERS AND HYBRID HEAT-PUMP HEATERS COMPRISING REVERSIBLE HEAT PUMPS

(116) 'reversible heat pump heater' means a heat-pump heater capable of both cooling and heating;

(117) 'cooling function' means providing chilled water to a water-based cooling system;

(118) 'low cooling temperature application' means an application where the reversible heat-pump heater delivers cooling at an indoor heat exchanger outlet temperature of 7 °C at design temperature, and at a specific water outlet temperature per part-load condition;

(119) 'medium cooling temperature application' means an application where the reversible heat-pump heater delivers cooling at an indoor heat exchanger outlet temperature of 18 °C at design temperature, and at a specific water outlet temperature per part-load condition;

(120) 'free cooling' means free cooling as defined in Annex VII, Part B, Section 1 point(3) of the Directive 2018/2001 ([5]);

(121) 'water-based cooling system' means the components or equipment necessary for the distribution of chilled water and the transfer of heat from indoor spaces to chilled water, where the purpose of the system is to attain and maintain the desired indoor temperature of an enclosed space, such as a building or parts thereof, for the thermal comfort of human beings;

(122) 'standard rated cooling capacity' ($P_{SR,c}$) means the cooling capacity of a reversible heat pump when providing space cooling at 'standard-rating conditions', expressed in kW;

(123) 'seasonal space cooling energy-efficiency' ($\eta_{s,c}$) means the ratio between the reference annual cooling demand pertaining to the cooling season covered by a heater, and the annual energy consumption for cooling, corrected by contributions accounting for temperature control and the electricity consumption of ground water pump(s), where applicable, expressed in %;

(124) 'seasonal energy-efficiency ratio' (*SEER*) means the overall energy-efficiency ratio of the heater, representative for the cooling season, calculated as the 'reference annual cooling demand' divided by the 'annual energy consumption for cooling';

(125) 'reference annual cooling demand' (Q_C) means the reference cooling demand to be used as the basis for the calculation of *SEER* and calculated as the product of the design cooling load ($P_{design,c}$) and the equivalent active-mode hours for cooling (H_{CE}), expressed in kWh;

(126) 'annual energy consumption for cooling' (Q_{CE}) means the energy consumption required to meet the 'reference annual cooling demand' and is calculated as the 'reference annual cooling demand' divided by the 'active mode seasonal energy-efficiency ratio' ($SEER_{on}$) and the electricity consumption of the unit for thermostat-off, standby, off and crankcase mode during the cooling season, expressed in kWh;

([5]) Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (*OJ L 328, 21.12.2018, pp. 82–209, ELI: http://data.europa.eu/eli/dir/2018/2001/oj).*

(127) ‘design cooling load’ ($P_{design,c}$) means the cooling load applied to a heater at the cooling reference design conditions defined in Annex VII, Table 1, whereby the design cooling load ($P_{design,c}$) is equal to the declared cooling capacity at outdoor temperature (T_j) equal to the reference design temperature for cooling ($T_{design,c}$), expressed in kW;

(128) ‘maximum ventilation exhaust air flow rate for space cooling’ ($q_{v,maxc}$) means the maximum flow rate of exhaust air at temperature conditions that can be used when assessing space-cooling efficiency;

(129) ‘equivalent active mode hours for cooling’ (H_{CE}) means the assumed annual number of hours the unit shall provide the ‘design cooling load’ ($P_{design,c}$) to satisfy the ‘reference annual cooling demand’, expressed in hours;

(130) ‘active mode seasonal energy efficiency ratio’ ($SEER_{on}$) means the average energy-efficiency ratio of the unit in active mode for the cooling function, constructed from part-load and bin-specific energy-efficiency ratios ($EER_{bin}(T_j)$) and weighted by the bin hours in which the bin condition occurs;

(131) ‘cooling part load ratio’ (plc(T_j)) means the outdoor temperature T_j minus 16 °C divided by the reference design temperature $T_{design,c}$ minus 16 °C;

(132) ‘part load for cooling’ ($Pc(T_j)$) means the cooling load at a specific outdoor temperature, calculated as the design cooling load multiplied by the part-load ratio and expressed in kW;

(133) ‘bin-specific energy efficiency ratio’ ($EER_{bin}(T_j)$) means the energy-efficiency ratio specific for every bin_j with outdoor temperature (T_j) in a season, derived from the part load, declared capacity and declared energy-efficiency ratio ($EER_d(T_j)$) and calculated for other bins through interpolation/extrapolation, when necessary corrected by the applicable degradation coefficient;

(134) ‘seasonal primary energy ratio in cooling mode’ ($SPER_c$) means the overall energy-efficiency ratio of the air conditioner or comfort chiller using fuels, representative for the cooling season;

(135) ‘seasonal fuel utilisation efficiency in cooling mode’ ($SFUE_c$) means the fuel-utilisation efficiency for the whole cooling season;

(136) ‘seasonal auxiliary energy factor in cooling mode’ ($SAEFc$) means the auxiliary energy efficiency for the cooling season, including the contribution of thermostat-off mode, standby mode, off mode, and crankcase-heater mode power modes;

(137) ‘fuel utilisation efficiency at partial load’ means the fuel-utilisation efficiency when cooling ($FUE_{c,bin}$) at outdoor temperature T_j;

(138) ‘auxiliary energy factor in cooling mode at partial load’ ($AEF_{c,bin}$) means the auxiliary energy efficiency when cooling at outdoor temperature (T_j);

6. DEFINITIONS RELATED TO WATER HEATING IN COMBINATION HEATERS

(139) ‘water heating energy efficiency’ (η_{wh}) means the ratio between the useful energy in the drinking or sanitary water provided by a combination heater and the energy required for its generation, expressed in %;

(140) ‘out of the box mode’ means the standard operating condition, setting or mode set by the supplier at factory level, to be active immediately after the heater installation, suitable for normal use by the end user according to the declared load profile;

(141) ‘load profile’ means a sequence of water draw-offs, as specified in Annex VII, Table 7; each combination heater meets at least one load profile;

(142) ‘mixed water at 40 °C’ (V40) means the equivalent volume of water that the heater can deliver at 40 °C;

(143) ‘water draw-off’ means a given combination of useful water flow rate, useful water temperature, useful energy content and draw-off temperature, as specified in Annex VII, Table 7;

(144) ‘useful water flow rate’ (f) means the minimum flow rate, expressed in litres per minute, for which hot water is contributing to the reference energy, as specified in Annex VII, Table 7;

(145) ‘useful water temperature’ (T_m) means the water temperature, expressed in degrees Celsius, at which hot water starts contributing to the reference energy, as specified in Annex VII, Table 7;

(146) ‘useful energy content’ (Q_{tap}) means the energy content of hot water, expressed in kWh, provided at a temperature equal to, or above, the useful water temperature, and at water flow rates equal to, or above, the useful water flow rate, as specified in Annex VII, Table 7;

(147) ‘energy content of hot water’ means the product of the specific heat capacity of water, the average temperature difference between the hot-water output and cold-water input, and the total mass of the hot water delivered;

(148) ‘draw-off temperature’ (T_p) means the average water temperature, expressed in degrees Celsius, to be achieved during water draw-off, as specified in Annex VII, Table 7;

(149) ‘reference energy’ (Q_{ref}) means the sum of the useful energy content of water draw-offs, expressed in kWh, in a particular load profile, as specified in Annex VII, Table 7;

(150) ‘maximum load profile’ means the tapping-load profile with the greatest reference energy that a combination heater can provide while fulfilling the temperature and flow rate conditions of that load profile;

(151) ‘daily electricity consumption’ (Q_{elec}) means the consumption of electricity for water heating over 24 consecutive hours under the declared load profile, expressed in kWh in terms of final energy;

(152) ‘daily electricity generation’ (Q_{elec_gen}) means the generation of electricity by cogeneration combination heaters for water heating over 24 consecutive hours under the maximum load profile, expressed in kWh in terms of final energy;

(153) ‘daily fuel consumption’ (Q_{fuel}) means the consumption of fuels for water heating over 24 consecutive hours under the declared load profile, expressed in kWh in terms of GCV;

(154) ‘annual electricity consumption’ (AEC) means the annual electricity consumption of a combination heater for water heating under the declared load profile and under given climate conditions, expressed in kWh in terms of final energy;

(155) ‘annual fuel consumption’ (AFC) means the annual fuel consumption of a combination heater for water heating under the declared load profile and under given climate conditions, expressed in GJ in terms of GCV;

(156) ‘ambient correction term’ (Q_{cor}) means a term which considers the fact that the place where the combination heater is installed is not an isothermal place, expressed in kWh;

(157) ‘self-learning’ means a function of the combination heater that automatically captures the end user’s use patterns of the water-heating functionality of the combination heater;

(158) ‘adaptive control’ means a control which adapts the temperature of the water stored in the combination heater depending on the use patterns captured with the self-learning function of the combination heater;

(159) ‘adaptive control factor’ (F_{AC}) means the water-heating energy-efficiency gain due to adaptive control under the conditions set out in Annex VII, Section 5.2, sub (b);

(160) ‘adapt’ is a Boolean either equal to 0 or to 1;

(161) ‘weekly electricity consumption with adaptive controls’ ($Q_{elec,week,adaptive}$) means the weekly water-heating electricity consumption of a combination heater with the adaptive-control function enabled, expressed in kWh;

(162) ‘weekly fuel consumption with adaptive controls’ ($Q_{fuel,week,adaptive}$) means the weekly water-heating fuel consumption of a combination heater with the adaptive-control function enabled, expressed in kWh in terms of GCV;

(163) ‘weekly electricity consumption without smart controls’ ($Q_{elec,week}$) means the weekly water-heating electricity consumption of a combination heater with the adaptive-control function disabled, expressed in kWh;

(164) ‘weekly fuel consumption without adaptive controls’ ($Q_{fuel,week}$) means the weekly water-heating fuel consumption of a combination heater with the adaptive-control function disabled, expressed in kWh in terms of GCV;

(165) ‘control factor’ (F_{ctrl}) means a factor accounting for the capability of instantaneous water heaters to set the water temperature independently of the water flow;

(166) ‘Passive Flue Heat Recovery Device’ (PFHRD) means a device integrated in the appliance or supplied with the appliance to transmit waste heat from the combustion products to the domestic hot water, as set out in Annex VII, Section 5;

(167) ‘maximum ventilation exhaust air flow rate for water heating’ ($q_{v,maxw}$) means the maximum flow rate of exhaust air at temperature conditions, as set out in Annex VII, Table 6, that can be used when assessing water-heating efficiency;

(168) ‘off-peak combination heater’ means a combination heater that can work in an off-peak application;

(169) ‘off-peak application’ means the ability of the water heater to be automatically (without the intervention of the end user each time) energised for a maximum period of eight consecutive hours between 22:00 and 07:00 of the 24-hour tapping pattern in the load profiles, as set out in Annex VII, Section 5;

7. DEFINITIONS RELATED TO SOLAR DEVICES

(170) 'solar collector' means a device designed to absorb solar irradiance and to transfer the thermal energy so produced to a fluid passing through it;

(171) 'Gross thermal yield' (GTY) means the reference annual thermal yield of the collector array of the solar device for a specific climate, in kWh/a, as set out in Annex VII, Section 8, calculated as the simple average of the thermal yield for the 25 ºC and 50 ºC collector operating temperature, in kWh/a;

(172) 'Gross area'(Ag) means the maximum projected area covered by the outer dimensions of the collector array, expressed in m²;

(173) 'solar device efficiency for space heating' ($\eta_{sol,sh}$) means the efficiency of a solar device for space heating, considering the energy-efficiency class of the tank if applicable, calculated by multiplying the solar-device factor by the tank-correction factor and expressed in %;

(174) 'solar device factor for space heating' ($f_{sol,sh}$) means a factor (>1) for the contribution of a solar device to the seasonal space-heating efficiency of a space heater comprising a package, as set out in Annex VII, Section 8 and Section 10;

(175) 'solar device efficiency for water heating' ($\eta_{sol,wh}$) means the efficiency of a solar device for water heating, considering the energy-efficiency class of the tank if applicable, calculated by multiplying the solar-device factor by the tank-correction factor, expressed in %;

(176) 'solar device factor for water heating' ($f_{sol,wh}$), means a factor (>1) representing the contribution of a solar device to the water-heating efficiency of a package of combination heater and solar device, as set out in Annex VII, Section 8 and Section 10;

(177) 'tank factor' (f_{tank}) means a factor in the calculation of the solar-device efficiency that depends on the energy-efficiency class of the solar hot-water storage tank, as set out in Annex VII, Section 8;

(178) 'non solar heat required' Q_{nonsol} means the part of the annual water-heating demand that is not covered by the solar-device yield and therefore must be provided by the water heater, in kWh/a;

(179) 'annual solar water heating demand' $Q_{wh,sol}$ means the water-heating demand per year to be met by the combination of solar device and water heater, in kWh/a;

(180) 'solar heat delivered' Q_{sol} means the part of the annual water-heating demand that is covered by the solar-device yield, in kWh/a;

8. DEFINITIONS RELATED TO HOT-WATER STORAGE TANKS

(181) 'standing loss' (S) means the heating power dissipated from a hot-water storage tank at standard-rating conditions, expressed in W;

9. DEFINITIONS RELATED TO SHOWER-WATER HEAT-RECOVERY DEVICES

(182) 'shower water heat recovery device factor' (fSWHRD,lp) means a factor representing the water-heating energy-efficiency gains of a combination heater package comprising a shower-water heat-recovery device for a specific load profile;

(183) ‘shower water heat recovery efficiency’ (ηSWHRD,lp) means the thermal efficiency of the shower-water heat-recovery device calculated as the ratio of the heat recovered by the device divided by the heat supplied to the device for a specific load profile;

10. DEFINITIONS RELATED TO PACKAGES

(184) ‘package seasonal space-heating efficiency’ ($\eta_{s,pack}$) means the ratio between the space-heating demand supplied by the package and the annual energy consumption required to meet this demand, expressed in %

(185) ‘package water heating energy efficiency’ ($\eta_{wh,pack}$) means the ratio between the useful energy provided by a water heating package and the energy required for its generation, expressed in %;

ANNEX II

Energy-efficiency classes and acoustic airborne-noise-emission classes

1. ENERGY-EFFICIENCY CLASSES

1.1. Seasonal space-heating-efficiency classes for space heaters and packages in medium-temperature heating applications

The seasonal space-heating energy-efficiency class, for average climate conditions, for space heaters and packages for medium-temperature application shall be determined on the basis of their seasonal space- heating energy-efficiency $\eta_{s,h}$ as set out in Table 1.

Table 1

Seasonal space-heating energy-efficiency classes of space heaters and packages for medium-temperature heating applications

Seasonal space-heating energy-efficiency class	Seasonal space-heating efficiency $\eta_{s,h,}$ in %
A	300
B	235
C	185
D	145
E	115
F	90
G	< 90

1.2. Seasonal space-heating-efficiency classes for space heaters and packages in low-temperature heating applications

The seasonal space-heating energy-efficiency class, for average climate conditions, for space heaters and packages, for low-temperature heating applications, shall be determined on the basis of their seasonal space-heating energy efficiency ηs,h as set out in Table 2.

Table 2

Seasonal space-heating energy-efficiency classes of heaters and packages, for low-temperature heating applications

Seasonal space-heating energy-efficiency class	Seasonal space-heating energy efficiency $\eta_{s,h,}$ in %
A	360
B	285

C	220
D	175
E	135
F	110
G	< 110

1.3. Water-heating energy-efficiency classes

The water-heating energy-efficiency class for average climate conditions, for combination heaters and packages containing a combination heater, shall be determined on the basis of their water-heating energy efficiency η_{wh}, as set out in Table 3.

Table 3

Water-heating energy-efficiency classes of combination heaters, categorised by declared load profiles

Water-heating energy-efficiency class	**Declared tapping profile of a combination heater**		
	S	**M**	**L-4XL**
	Water-heating energy efficiency η_{wh}, in %		
A	160	210	260
B	120	160	210
C	90	120	160
D	70	90	120
E	49	70	90
F	46	49	49
G	< 46	< 49	< 49

2. ACOUSTIC AIRBORNE-NOISE-EMISSION CLASS

The acoustic airborne-noise-emission class of heaters in heating mode shall be determined on the basis of their sound-power levels, as set out in Table 4.

Table 4

Acoustic airborne-noise-emission classes

Sound Power Level dB(A)	**P_4 or $P_{rated,hp}$ ≤ 6 kW**		**6 < P_4 or $P_{rated,hp}$ ≤ 12 kW**		**12 < P_4 or $P_{rated,hp}$ ≤ 30 kW**		**30 < P_4 or $P_{rated,hp}$ ≤ 70 kW**	
	In-door	Out-door	In-door	Out-door	In-door	Out-door	In-door	Out-door
A	30	45	30	45	35	50	45	60
B	35	50	35	50	40	55	50	65
C	40	55	40	55	45	60	55	70
D	45	60	45	60	50	65	60	75
E	≥ 60	≥ 65	≥ 65	≥ 70	≥ 70	≥ 78	≥ 80	≥ 88

ANNEX III

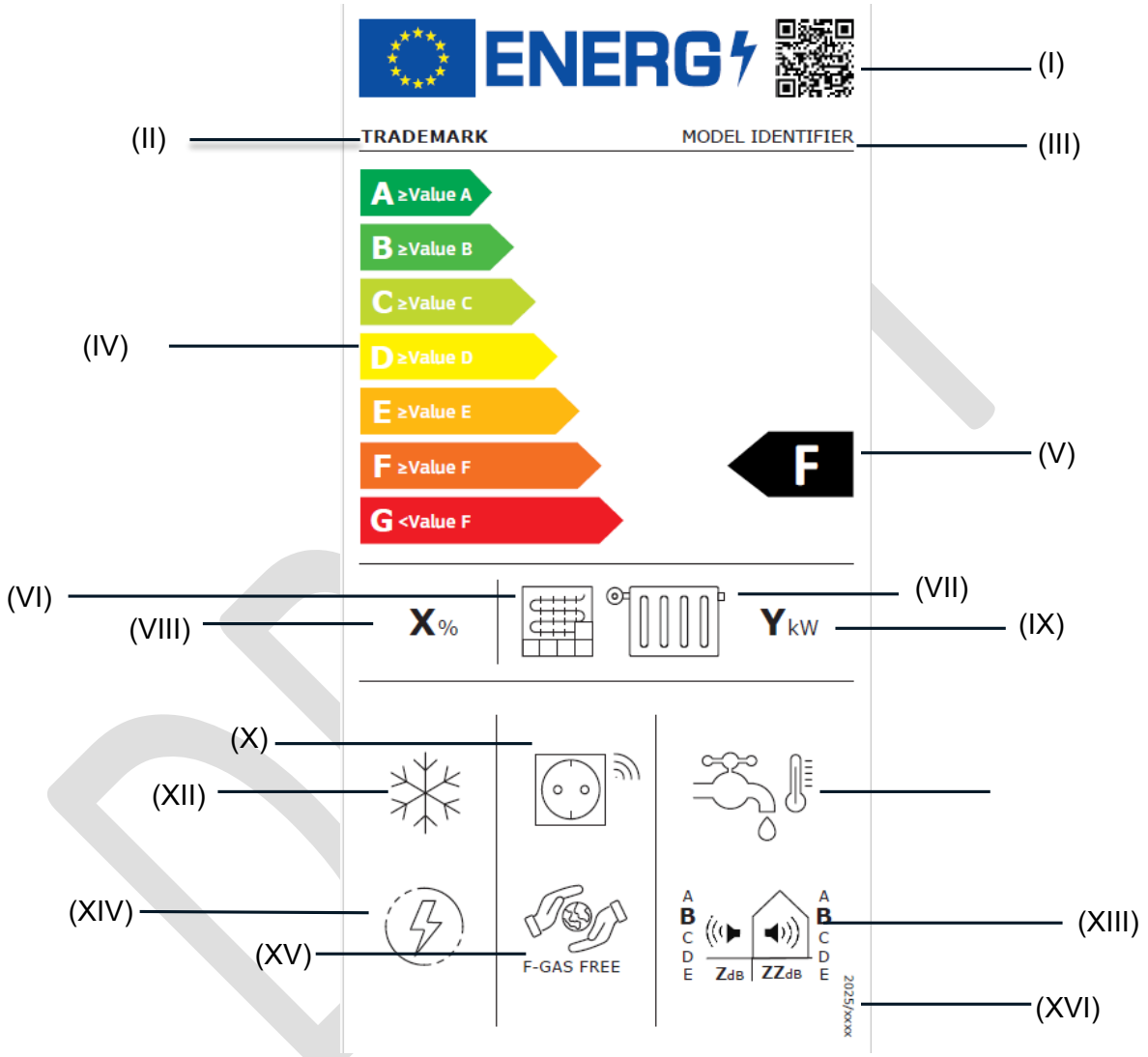
Label

1. LABEL FOR SPACE AND COMBINATION HEATERS

1.1. LABEL CONTENT FOR SPACE AND COMBINATION HEATERS

Figure 1

Label for space and combination heaters



(a) The following information shall be included in the label:

I. QR code linking to the product-information database on the European Product Registry for Energy Labelling;

II. supplier's name or trademark;

III. supplier's model identifier;

IV. scale of energy-efficiency classes from A to G, with the class boundary indicated for each class in accordance with point b;

V. for average climate conditions, the space-heating energy-efficiency-class boundaries determined in accordance with Annex II Table 1 for medium-

temperature heating application and Annex II Table 2 for low-temperature heating application, with heating temperature application as defined in VIII;

VI. if applicable, the low-temperature heating application;

VII. if applicable, the medium-temperature heating application;

VIII. the seasonal space-heating energy efficiency determined in accordance with Section 3 of Annex VII, for average climate conditions; for heat-pump heaters and hybrid heat-pump heaters, the space-heating energy-efficiency class on the label must be the one for medium-temperature heating applications, unless the heater cannot operate in medium temperatures, in which case the class for low-temperature heating applications must be shown;

IX. standard-rated heat output in kW, with heating temperature application as defined in VIII;

X. if applicable, icon showing that the appliance is compliant with the EU Code of Conduct for the interoperability of energy-smart appliances;

XI. if applicable, indication for combination heaters if they can supply both space heating and water heating;

XII. if applicable, indication that the appliance can supply cooling or free cooling;

XIII. airborne acoustic noise, as explained in point (c), with the emissions expressed in dB(A) with respect to 1 pW and rounded to the nearest integer, and airborne acoustic noise-emission class, determined in accordance with Annex II;

XIV. cogeneration electric power output;

XV. indication of a heat pump having a refrigerant fluid with a low global-warming potential;

XVI. the number of this Regulation, that is [2025/xxxx].

(b) The supplier shall indicate the lower-class boundary for each class in the following way:

(1) for heat-pump heaters and hybrid heat-pump heaters which can work only in a medium-temperature heating application, the class boundaries shall be placed on the label according to Table 1, Annex II;

(2) for heat-pump heaters and hybrid heat-pump heaters which can work only in a low-temperature heating application, the class boundaries shall be placed on the label according to Table 2, Annex II;

(3) for heaters other than heaters referred to previously in points b(1) and b(2) of this section, the following lower-class boundaries shall be placed on the label:

(a) A-class: ≥ 300;

(b) B-class: ≥ 235;

(c) C-class: ≥ 185;

(d) D-class: ≥ 145;

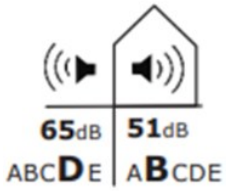
(e) E-class: ≥ 115;

(f) F-class: ≥ 90;

(g) G-class: < 90.

(c) The supplier shall indicate the sound-power value and the acoustic airborne-noise-emission class of the heater on the label in the following way:

(i) for products emitting outdoor and indoor sound, the following icon shall be placed on the label in the space indicated by 'XIII' in point (a):



[double sound icon - the above picture is a mock-up intended to show the idea of the icon and will be substituted with a Commission design once ready]

(ii) for products emitting only indoor sound, the following icon shall be placed on the label in the space indicated by 'XIII' in point (a):

[single sound icon - the above picture is a mock-up intended to show the idea of the icon and will be substituted with a Commission design once ready].

1.2. LABEL DESIGN FOR SPACE AND COMBINATION HEATERS

Figure 2

Label design for space and combination heaters

[Figure showing the label with dimensions will be provided once the draft has been approved]

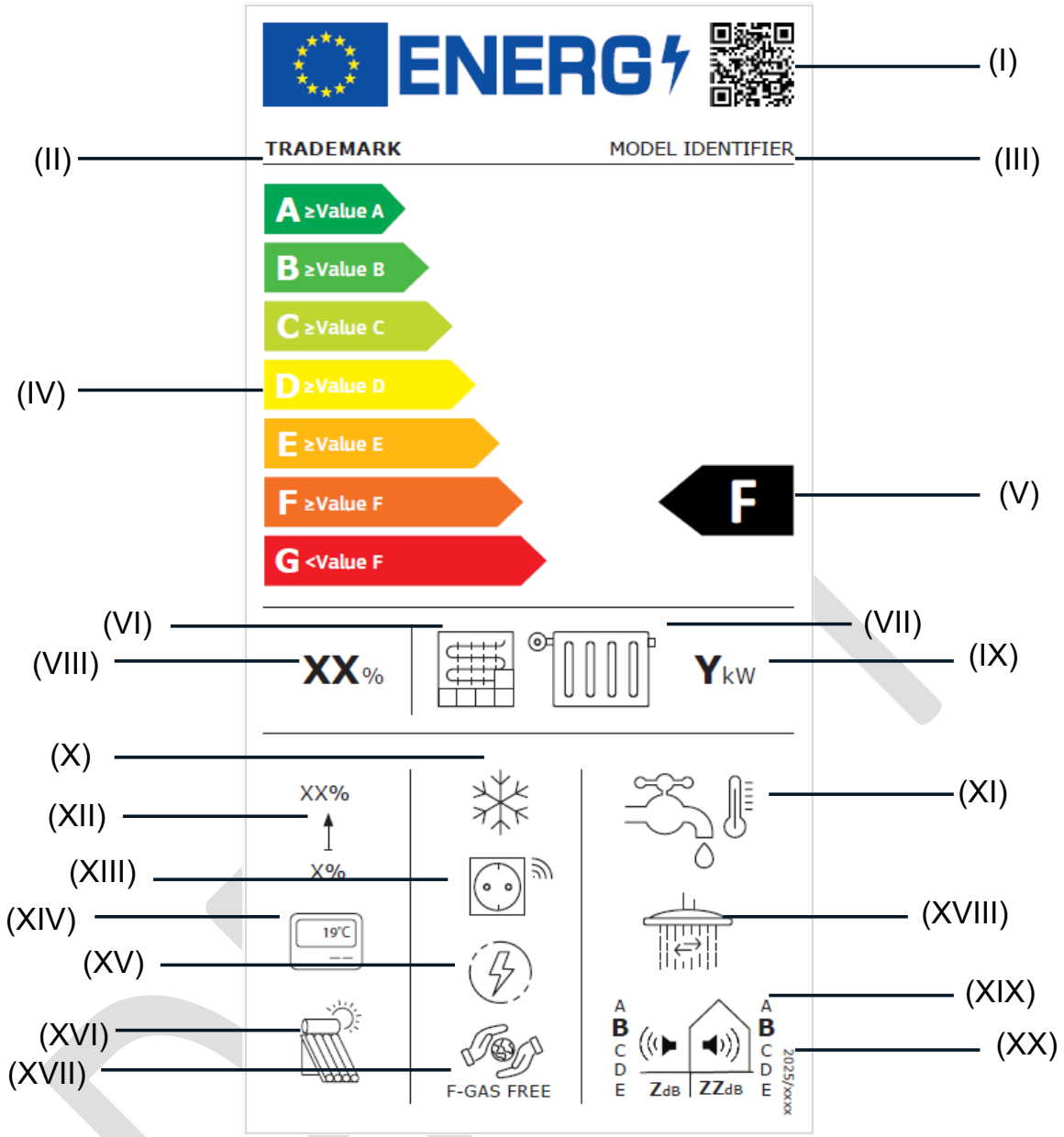
[Once the final draft has been approved, the following section will display the information related to the design of the label as provided by the EC designer]

2. PACKAGE LABEL

2.1. LABEL CONTENT FOR PACKAGES

Figure 3

Package label



[figure showing the label with Roman-numeral indicators – the above picture is a mock-up intended to show the idea of the label and will be substituted with a Commission design once ready]

(a) The following information shall be included in the label:

I. QR code linking to the product- information database on the European Product Registry for Energy Labelling;

II. supplier's name or trademark;

III. supplier's model identifier;

IV. scale of energy-efficiency classes from A to G, with the class boundary indicated for each class in accordance with point (b);

V. the space-heating energy-efficiency class determined in accordance with Tables 1 and 2 of Annex II, for the average climate conditions of the package;

VI. if applicable, the low-temperature heating application;

VII. the medium-temperature heating application;

VIII. for average climate conditions, the space-heating energy-efficiency-class boundaries determined in accordance with Annex II Table 1 for medium-temperature heating application and Annex II Table 2 for low-temperature heating application, with heating temperature application as defined in VIII;

IX. standard-rated heat output in kW, at the temperature application defined in VIII;

X. indication if the appliance can supply cooling or free cooling;

XI indication for combination heaters if they can supply both space heating and water heating;

XII. icon on the increase in seasonal space-heating efficiency due to the inclusion of additional components in the package showing the values for energy efficiency before and after the increase;

XIII. if applicable, icon showing that the appliance is compliant with the EU Code of Conduct for the interoperability of energy-smart appliances;

XIV. air-temperature-control capability;

XV. cogeneration electric power output;

XVI. if applicable, indication as to whether the package includes a solar device;

XVII. indication of a heat pump with a refrigerant having a low global-warming potential;

XVIII. if applicable, indication as to whether the package includes shower-water heat-recovery devices;

XIX. airborne acoustic noise, as explained in point (c), with the emissions expressed in dB(A) with respect to 1 pW and rounded to the nearest integer, and airborne acoustic noise-emission class, determined in accordance with Table 3, Annex II;

XX. the number of this Regulation, that is [xxxx/2025];

(b) The supplier shall indicate the lower-class boundary for each class in the following way:

(i) for packages including heat-pump heaters and hybrid heat-pump heaters which can work only in a low-temperature heating application in average climate conditions, the following class boundaries shall be placed on the label:

(1) A-class: ≥ 360;

(2) B-class: ≥ 285;

(3) C-class: ≥ 220;

(4) D-class: ≥ 175;

(5) E-class: ≥ 135;

(6) F-class: ≥ 110;

(7) G-class: < 110;

(ii) for packages including heaters other than heaters referred to in point (i), the following lower-class boundaries shall be placed on the label:

(1) A-class: ≥ 300;

(2) B-class: ≥ 235;

(3) C-class: ≥ 185;

(4) D-class: ≥ 145;

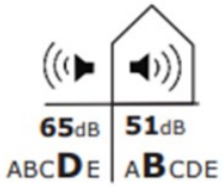
(5) E-class: ≥ 115;

(6) F-class: ≥ 90;

(7) G-class: < 90;

(c) The supplier shall indicate the sound-power values, and the acoustic airborne-noise-emission class of the heater included in the package on the label in the following way:

(i) for products emitting outdoor and indoor sound, the following icon shall be placed on the label in the space indicated by 'XI' in point (a):



[double sound icon - the above picture is a mock-up intended to show the idea of the icon and will be substituted with a Commission design once ready]

(ii) for products emitting only indoor sound, the following icon shall be placed on the label in the space indicated by 'XI' in point (a):

[single sound icon - the above picture is a mock-up intended to show the idea of the icon and will be substituted with a Commission design once ready];

2.2. LABEL DESIGN FOR PACKAGES

Figure 4

Label design for packages

[Figure showing the label with dimensions will be provided once the draft has been approved]

[Once the final draft has been approved, the following section will display the information related to the design of the label as provided by the EC designer]

ANNEX IV

Product-information sheet and package-information sheet

1. REQUIREMENTS FOR PRODUCT-INFORMATION SHEET AND PACKAGE-INFORMATION SHEET

(a) Suppliers shall ensure that the product-information sheet and the package-information sheet are clear, easy to read, and use language that is accessible to both consumers and installers. Visual aids such as tables, graphs, or icons shall be included where appropriate to increase comprehension.

(b) The format and content of the product-information sheet and package-information sheet shall allow suppliers to present information in a manner suited to their products while adhering to the minimum required content specified in the present Regulation.

(c) The supplier shall enter into the public part of the product database the information as set out in:

(i) for fuel boiler heaters – Table 1;

(ii) for electric boiler heaters – Table 2;

(iii) for cogeneration heaters – Table 3;

(iv) for cogeneration heaters with a backup boiler – Table 4;

(v) for heat-pump heaters and hybrid heat-pump heaters – Table 5 (in this table, information for high-temperature applications is optional) and part A of Table 6 only for average-climate and medium-temperature heating applications, or for average-climate and low-temperature heating applications for heat pump that cannot operate in average-climate and medium-temperature heating applications;

(vi) for reversible heat-pump heaters and hybrid heat-pump heaters, the supplier must also provide information set out in part A of Table 7;

(vii) for combination heaters, the supplier must also provide the information set out in Table 8 for the load profile declared in accordance with Table 7, Section 6, Annex VII; for outdoor heat pump combination heater, the manufacturer shall provide the information set in Table 8 for average, colder and warmer climate conditions;

(viii) for the energy-smart appliances – part A, Table 9;

(ix) for temperature controls – Table 10;

(x) for solar devices – Table 11;

(xi) for shower-water heat-recovery devices – Table 12;

(xii) for packages – Table 13.

(d) If a given parameter is not applicable to the product or package, the supplier shall fill in the relevant cell in the table with the expression ‘N/A’.

(e) The supplier shall add to the product-information sheet and package-information sheet any specific precautions that are to be taken when the heater is assembled, installed or maintained. For B1 boiler heaters and electric boiler heaters the following standard text must be added: *This heater contains a natural draught boiler,*

which is intended to be connected only to a flue shared between multiple dwellings in existing buildings that evacuates the residues of combustion to the outside of the room containing the boiler. It draws the combustion air directly from the room and incorporates a draught diverter. Due to lower efficiency, any other use of this boiler shall be avoided and would result in higher energy consumption and higher operating costs.

(f) Any supplier providing a package for which this supplier is the manufacturer, authorised representative or importer within the meaning of Directive 2009/125/EC shall enter into the European Product Registry for Energy Labelling (EPREL) the information related to the package and its components.

(g) The product-information sheet and the package-information sheet shall include the same information that is entered into the public part of the product database.

(h) The information in the product-information sheet and package-information sheet shall clearly explain to consumers the relationship between energy efficiency, fuel or electricity consumption and running costs, as those factors are of primary concern to consumers.

(i) The user manual or other literature provided with the product or package shall clearly indicate the link to the model of the product or to the model of the package in the European Product Registry for Energy Labelling (EPREL) as a human-readable Uniform Resource Locator (URL) or as QR code or by providing the product or package registration number.

Table 1

Fuel boiler heaters

Fuel boiler heater					
Brand or trademark:	Model identifier:				
Space-heating energy-efficiency class:					
Fuel type:	Gaseous fuel □ Liquid fuel □				
If gaseous fuel:	Reference gas: G20 □ G25 □ G30 □ G31 □		B1 boiler heater: □		
			Combination heater: □		
			PFHRD: □		
Heat output and input			**Space-heating efficiency**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Standard-rated heat output (P4)	x,x	kW	Seasonal space-heating efficiency ($\eta_{s,h}$)	x,x	%
Standard-rated heat input (P_{hs})	x,x	kW	Seasonal space-heating energy efficiency in active mode (η_{son})	x,x	%
Part-load output at 30% P_{hs} (P_1)	x,x	kW	Useful efficiency at minimum-	x,x	%

			part-load input (η_0)		
Min part-load output at min pl input (P_0)	x,x	kW	Useful efficiency at P_{hs} (η_4)	x,x	%
			Useful efficiency at 30% P_{hs} (η_1)	x,x	%
Turndown ratio	x,x	%	Heat loss in operating modes without heat demand ($P_{h,l}$)	x,xxx	kW

Electricity consumption			**Other**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Full-load auxiliary power consumption (elmax)	x,xxx	kW	Sound-power class indoors	x	N/A
			Sound-power class outdoors	x	N/A
Part-load auxiliary power consumption (elmin)	x,xxx	kW	Sound-power level (L_{WA}) indoors	x	dB(A)
			Sound-power level (L_{WA}) outdoors	x	dB(A)
Standby-mode power consumption (P_{SB})	x,xxxx	kW	NO_X emission value	x,x	mg/ kWh fuel input

Table 2

Electric boiler heaters

Electric boiler heater					
Brand or trademark:	Model identifier:				
Space-heating energy-efficiency class:					
Energy-smart appliance: □			Combination heater: □		
Heat output			**Space-heating efficiency**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Standard-rated heat output (P_4)	x,x	kW	Seasonal space-heating efficiency ($\eta_{s,h}$)	x,x	%
Electricity consumption			**Other**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Standard-rated electric power	x,x	kW	Sound-power class indoors		N/A

input at P_4 (EC)			Sound-power class outdoors		N/A
Standby-mode power consumption (P_{SB})	x,xxxx	kW	Sound-power level (L_{WA}) indoors	x	dB(A)
			Sound-power level (L_{WA}) outdoors	x	dB(A)

Table 3

Cogeneration heaters

Cogeneration heater					
Brand or trademark:	Model identifier:				
Space-heating energy-efficiency class[(1)]:					
Fuel type:	Gaseous fuel □ Liquid fuel □		Combination heater: □		
If gaseous fuel:	Reference gas: G20 □ G25 □ G30 □ G31 □				
Heat output and input			**Space-heating efficiency**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Standard-rated heat output (P_4)	x,x	kW	Seasonal space-heating efficiency ($\eta_{s,h}$)	x,x	%
Standard-rated heat input (P_{hs})	x,x	kW	Seasonal space-heating efficiency in active mode (η_{son})	x,x	%
Electricity input and output			**Others**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Full-load auxiliary power (elmax)	x,xxx	kW	Sound-power class indoors		N/A
			Sound-power class indoors		N/A
Rated electric power output (P_{el})	x,x	kW	Sound-power level (L_{WA}) indoors	x	dB(A)
			Sound-power level (L_{WA}) outdoors	x	dB(A)
			NOx emission value	x,x	mg/kWh

Table 4

Cogeneration heaters with backup boiler

Backup cogeneration heater

Brand or trademark:	Model identifier:				
Space-heating energy-efficiency class[1]:					
Fuel type: Gaseous fuel □ Liquid fuel □			Combination heater: □		
If gaseous fuel: Reference gas: G20 □ G25 □ G30 □ G31 □					
Heat output and input			**Space-heating efficiency**		
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Standard-rated heat output (P_4)	x,x	kW	Seasonal space-heating efficiency ($\eta_{s,h}$)	x,x	%
Heat output of the cogeneration heater alone in a 30/50 temperature regime (P_{CHP})	x,x	kW	Seasonal space-heating efficiency in active mode (η_{son})	x,x	%
Standard-rated heat input (P_{hs})	x,x	kW	Efficiency at standard-rated heat output (η_4)	x,x	%
Heat input of the cogeneration heater alone in a 30/50 temperature regime (Pinput_CHP)	x,x	kW	Efficiency of the cogeneration heater alone in a 30/50 temperature regime (η_{CHP})	x,x	%
Electricity input and output			Efficiency at 30% of the standard-rated heat output in a 30/50 temperature regime ($\eta 1$)	x,x	%
Item	**Value**	**Unit**	**Others**		
Rated electric power output (P_{el})	x,x	kW	**Item**	**Value**	**Unit**
Rated electric power output in a 30/50 temperature regime (P_{el_CHP})	x,x	kW	Sound-power class outdoors		N/A
Full-load auxiliary power (elmax)	x,xxx	kW	Sound-power level (L_{WA}) indoors	x	dB(A)
Others			Sound-power level (L_{WA}) outdoors	x	dB(A)
Sound-power class indoors		N/A	x,x	x,x	mg/kWh

Table 5

Heat-pump heaters and hybrid heat-pump heaters (general information)

Heat pump and hybrid heat pump	
Brand or trademark	Model identifier:
Space-heating energy-efficiency class[1]:	
Heater type	

Electric heat-pump heater □ with physical electric backup □ with virtual electric backup □ Fuel heat-pump heater □ with fuel backup heater □ Hybrid heat-pump heater □	
Heat-pump heater / heat-pump heat-generator type by heat source: ventilation exhaust air □ outdoor air □ ground heat exchanger □ ground direct exchange □	Cooling: none: □ by reverse cycle: □ by free cooling: □ For use in space-cooling temperature applications: Low: □ Medium: □
If fuel heat-pump heater / hybrid heat-pump heater comprising a heat-generator utilising fuel combustion for heat generation: Fuel type: Gaseous fuel □ Liquid fuel □ *If gaseous fuel:* Reference gas: G20 □ G25 □ G30 □ G31 □	Energy-smart appliance: □ F-gas free refrigerant: yes □ no □ Combination heater: □

Space-heating performances

Item	Climate conditions	**Value**			**Unit**
		Temperature application			
		Low	Medium	High (optional)	
Condition in which the heat pump can work	Average	□	□	□	
	Warmer	□	□	□	
	Colder	□	□	□	
Seasonal space-heating energy efficiency ($\eta_{s,h}$)	Average	x,x	x,x	x,x	%
	Warmer	x,x	x,x	x,x	
	Colder	x,x	x,x	x,x	
Declared heat output (P_{dh})	Average	x,x	x,x	x,x	kW
	Warmer	x,x	x,x	x,x	
	Colder	x,x	x,x	x,x	
$P_{design,h}$	Average	x,x	x,x	x,x	kW
	Warmer	x,x	x,x	x,x	
	Colder	x,x	x,x	x,x	
Physical backup	Average	x,x	x,x	x,x	kW
	Warmer	x,x	x,x	x,x	
	Colder	x,x	x,x	x,x	
Virtual backup	Average	x,x	x,x	x,x	kW
	Warmer	x,x	x,x	x,x	
	Colder	x,x	x,x	x,x	

Other

Item	Value	Unit	Item	Value	Unit
NO_X emissions value	x,x	(mg/kWh input)	Sound-power class indoors		N/A
			Sound-power class outdoors		N/A
			Sound-power level (L_{WA}) indoors	x	dB(A)
			Sound-power level (L_{WA}) indoors	x	dB(A)

* If the heat pump is not working for a specific climate and temperature application, the manufacturer must fill the cell with 'N/A'

Table 6

Heat-pump heaters and hybrid heat-pump heaters (Calculation of seasonal space-heating energy efficiency)

PART A										
Climate and temperature dependent parameters										
Climate: Average □ Warmer □ Colder □ **Temperature application: Low □ Medium □ High □**										
Item	**Tj**	**pl**	***P_h***	***P_{dh}***	***COP_d***	***C_{dh}***	***P_{add}***	***$Input_{add}$***	***AEF***	***COP_{bin}***
					FUE_d					***FUE***
Unit and decimal place accuracy	**°C** x	**%** xx	**kW** x.x	**kW** x.x	**(-)** x.xx	**(-)** x.xx	**kW** x.x	**kW** x.x	**kW** x.x	**(-)** x.xx
Test conditions	**Value**									
A										
B										
C										
D										
E (Tbiv or *Tfb,off*)										
F (TOL or *Thp,on)*										
G (-15 °C, only *if TOL < -20 °C, colder*										

Climate and temperature independent parameters					
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Power in thermostat-off mode (P_{TO})	x,xxxx	kW	Seasonal space-heating energy efficiency in active mode (η_{son})	x,x	%
Power in standby mode (P_{SB})	x,xxxx	kW	additional annual auxiliary	x	kW/a

			electricity consumption (Q_{aux})		
Power in crankcase mode (P_{CK})	x,xxxx	kW	annual heat demand (Q_H)	x	kWh/a
Power in off mode (P_{OFF})	x,xxxx	kW	equivalent number of annual hours in active mode (H_{HE})	x	H
seasonal auxiliary electricity factor (SAEF)	x,x	kW	annual heating energy consumed (Q_{HE})	x	kWh/a
F(1)	x	%	seasonal coefficient of performance in active mode ($SCOP_{on}$)	x,x	N/A
F(2)	x	%	seasonal fuel-utilisation efficiency (SFUE)	x,x	N/A
F(3)	x	%	seasonal primary energy ratio (SPER)	x,x	N/A

PART B

Climate: Average □ Warmer □ Colder □ Temperature application: Low □ Medium □ High □

Item	***COP*** ***d***	***C_{dh}***	***P_{add}***	***$Input_{add}$***	***COP_{bin}***	***Positions of actuators, compressor(s) frequency of rotation in Hz or capacity stages, fan(s) frequency of rotation in Hz, circulator(s) frequency of rotation in Hz, depending on heat source of heat pump or hybrid heat pump, engine frequency of rotation in Hz.***			
	FUE ***d***				***FUE***				
Unit and decimal place accuracy	(-) x.xx	(-) x.xx	kW x.x	kW x.x	(-) x.xx	Hz **x.x**	Hz **x.x**	Hz **x.x**	Hz **x.x**
Test conditions	**Value**								
A									
B									
C									
D									

E (Tbiv or *Tfb,off*)									
F (TOL or *Thp,on)*									
G (-15 °C, only *if TOL < -20 °C, colder climate)*									
Other information required to set up the unit									

Table 7

Heat-pump heaters and hybrid heat-pump heaters (3 – Cooling)

PART A							
Item					**Value**		**Unit**
					Temperature application		
					Low	Medium	
Seasonal space cooling energy efficiency ($\eta_{s,c}$)					x,x	x,x	%
Design load for cooling ($P_{designc}$)					x,x	x,x	kW
Climate and temperature dependent parameters							
Climate conditions: Average □ Warmer □ Colder □ Temperature application: Low □ Medium □ High □							
Item	**Tj**	**pl**	***P_c***	***P_{dc}***	***EER_d*** ***$FUEC_d$***	***EER_{bin}*** ***$FUEC_{bin}$***	***C_{dc}***
Unit and decimal place accuracy	**°C** x	**%** xx	**kW** x.x	**kW** x.x	**(-)** x.xx	**(-)** x.xx	**(-)** x.xx
Test conditions	**Value**						

A												
B												
C												
D												

Climate and temperature independent parameters					
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Power in thermostat-off mode (P_{TO})	x,xxxx	kW	F(3)	x	%
Power in standby mode (P_{SB})	x,xxxx	kW	additional annual auxiliary electricity consumption (Q_{aux})	x	kW/a
Power in crankcase mode (P_{CK})	x,xxxx	kW	annual cooling demand (Q_c)	x	kWh
Power in off mode (P_{OFF})	x,xxxx	kW	equivalent number of annual hours in active mode (H_{CE})	x	H
seasonal auxiliary electricity factor ($SAEF_c$)	x,x	kW	annual heating energy consumed (Q_{CE})	x	kWh/a
F(1)	x	%	$SEER_{on}$	x,x	(-)
F(2)	x	%	seasonal fuel-utilisation efficiency ($SFUE_c$)	x,x	(-)

PART B

Climate: Average □ Warmer □ Colder □ Temperature application: Low □ Medium □

Item	***Compressor(s) frequency of rotation in Hz or capacity stages***	***Outdoor fan(s) frequency***	***Condenser flow***	***Evaporator flow***
Unit	**Hz**	**Hz**	**m^3/h**	**m^3/h**
Test conditions	**Value**			
A	x	x	x,xx	x,xx
B	x	x	x,xx	x,xx
C	x	x	x,xx	x,xx
D	x	x	x,xx	x,xx

Other information required to set up the unit

Table 8

Water-heating parameters

Water-heating efficiency					
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Load profile (S-4XL)		-	Water-heating efficiency (η_{wh})	x,x	%
Electricity consumption for water heating (Q_{elec})	x	kWh	Water-heating energy-efficiency class		
Fuel consumption for water heating (Qfuel)	x	kWh	Mixed water at 40 °C (V40)	x,x	L
Adaptive control: □ *If adaptive control, fill in the part below*					
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Weekly electricity consumption for water heating ($Q_{elec,week}$)	x,x	kWh	Weekly electricity consumption for water heating with adaptive control enabled ($Q_{elec,week,adaptive}$)	x,x	kWh
Weekly fuel consumption for water heating ($Q_{fuel,week}$)	x,x	kWh	Weekly fuel consumption for water heating with adaptive control enabled ($Q_{fuel,week,adaptive}$)	x,x	kWh
Off-peak combination heater: □ *If off-peak combination heater, fill in the part below*					
Load profile (S-4XL) in off-peak applications		(-)	Water-heating efficiency (η_{wh}) in off-peak applications	x,x	%
			Mixed water at 40 °C (V40) in off-peak applications	x,x	L

Table 9

Energy-smart appliances: Product-information sheet and technical information

Energy-smart appliances	
Part A – Product-information sheet	
Supplier's name or trademark, commercial registration number and address	
Model identifier	

Appliance compliant with the EU Code of Conduct for the interoperability of energy-smart appliances	□ Appliance compliant
How does the appliance achieve compliance with the Code of Conduct?([6])	□ Dongle/adaptor □ Cloud connection □ Built in the appliance
Which use cases does the appliance implement? ([7])	□ Flexible start □ Power-consumption monitoring □ Power-consumption limitation □ Incentive table-based power-consumption management □ Manual operation □ Future use cases ([8])
Manufacturer's link to free access website with end-user information	
Part B – Technical documentation	
Communication protocol used to implement the use cases:	□ SPINE □ SPINE IoT □ Matter □ Home Connectivity Alliance □ S2 □ Others (please specify) [_…__]

([6]) Only one can be selected.
([7]) More than one option can be selected.
([8]) Future use cases can be considered when the Code of Conduct is updated, as new versions will integrate evolving solutions and protocols to address emerging needs.

Table 10

Temperature controls

Temperature control					
Brand or trademark:	Model identifier:				
Item	**Value**	**Unit**	**Item**	**Value**	**Unit**
Class of the temperature control			Contribution of the temperature control to seasonal space-heating energy efficiency		% points

Table 11

Solar devices

Solar device									
Brand or trademark:			Model identifier:						
Solar-device factor for space heating									
Climate	**Number of solar collectors *****	**Gross area of collector array*** [m^2]**	**Annual heating demand********						
			Q_H [kWh]	x	x	X	x	x	[…]
			$P_{design,h}$ [kW]	x,x	x,x	x,x	x,x	x,x	[…]
			P_4 [kW]	x,x	x,x	x,x	x,x	x,x	[…]
	x	**x,x**		**Solar-device factor for space heating (per climate, collector surface and annual heating demand, in % points)*, ********					
Average				x,x	x,x	x,x	x,x	x,x	[…]
Warmer				x,x	x,x	x,x	x,x	x,x	[…]
Colder				x,x	x,x	x,x	x,x	x,x	[…]
Average	**x**	**x,x**		x,x	x,x	x,x	x,x	x,x	[…]
Warmer				x,x	x,x	x,x	x,x	x,x	[…]
Colder				x,x	x,x	x,x	x,x	x,x	[…]
[…]	[…]	[…]		[…]	[…]	[…]	[…]	[…]	[…]

Solar-device factor for water heating								
Climate	**Number of solar collectors**	**Gross area of collector array [m²]**	**Load profile of combination heater included in the package**					
			M	**L**	**XL**	**XXL**	**3XL**	**4XL**
			Solar-device factor for water heating (per climate, chosen collector surface and load profile, in % points)**					
Average	**x**	**x,x**	x,x	x,x	x,x	x,x	x,x	x,x
Warmer			x,x	x,x	x,x	x,x	x,x	x,x
Colder			[…]******	x,x	x,x	x,x	x,x	x,x

* Not less than 100% and not more than 300%.

** Not less than 100% and not more than 240% for colder climate conditions, 450% for average climate conditions and 500% for warmer climate conditions.

*** Additional cells with corresponding values can be included based on the number of solar collectors and the gross collector area. The ' […] ' notation signifies that the table may be extended, following the structure of the referenced table.

**** All provided values are subject to potential modifications or adjustments, as necessary, depending on specific declarations made by the supplier.

****** The ' […] ' notation also indicates that the table may be extended with additional rows below depending on the supplier's declarations.

Table 12

Devices for recovering heat from shower water

Shower-water heat-recovery device								
Brand or trademark:	Model identifier:							
Load profile of combination heater included in the package	XS	S	M	L	XL	XXL	3XL	4XL
Shower-water heat-recovery-device factor $f_{SWHRD,lp}$	x,x	x,x	x,x	x,x	x,x	x,x	x,x	x,x
Shower-water heat-recovery-device efficiency $\eta_{SWHRD,lp}$	x,x	x,x	x,x	x,x	x,x	x,x	x,x	x,x
$\eta_{12.5}$	x,x	x,x	x,x	x,x	x,x	x,x	x,x	x,x
$q_{12.5}$	x,x	x,x	x,x	x,x	x,x	x,x	x,x	x,x
η_i	x,x	x,x	x,x	x,x	x,x	x,x	x,x	x,x

q_i	x,x	x,x	x,x	x,x	x,x	x,x	x,x	x,x

Table 13

Packages

Package					
Brand or trademark:					
Model identifier:					
Package parameters					
For use in temperature application: Low □ Medium □ High			For use in climate conditions: Average □ Warmer □ Colder □		
Space heating			*If package includes combination heater* **Water heating**		
Parameter	**Value**	**Unit**	**Parameter**	**Value**	**Unit**
Seasonal space-heating energy efficiency	x,x	%	Water-heating energy efficiency	x,x	%
Standard-rated heat output for space heating	x,x	kW	Load profile		S-4XL
Space heating energy efficiency class (1)		A-G	Water heating energy efficiency class (1)		A-G
Package elements					
Heater included in the package					
Type of heater:			**Space heating**		
Fuel boiler heater □ Electric boiler heater □ Hybrid boiler heater □ Cogeneration heater □ Hybrid cogeneration heater □ Electric heat-pump heater □ Fuel heat-pump heater □ Hybrid heat-pump heater □			**Parameter**	**Value**	**Unit**
			Seasonal space-heating energy efficiency	x,x	%
			Space heating energy efficiency class (1)		A-G
			If combination heater **Water heating**		
Combination heater □			**Parameter**	**Value**	**Unit**

Reversible heat-pump heater □	Water-heating energy efficiency	x,x	%
Free cooling □	Water heating energy efficiency class (1)		A-G

If reversible heat-pump heater

Space cooling

Parameter	**Value**		**Unit**
	Temperature application		
	Low	Medium	
Seasonal space-cooling energy efficiency ($\eta_{s,c}$)	x,x	x,x	%
Design load for cooling ($P_{designc}$)	x,x	x,x	kW

Link to heater model included in the package:	https://eprel.ec.europa.eu/qr/*EPREL identifier*

Other elements of the package

Temperature control □	**Parameter**	**Value**	**Unit**
Number of products in the package:	Temperature-control class		A-G
	Contribution factor to $\eta_{s,h}$ of the package (TC)	x	% points

Link to temperature control model included in the package:	https://eprel.ec.europa.eu/qr/*EPREL identifier*

Solar device □	**Parameter**	**Value**	**Unit**
Number of products in the package:	Solar-device factor for space heating	x,x	**% points**
	Solar-device factor for water heating	x,x	**% points**

Link to solar device model included in the package:	https://eprel.ec.europa.eu/qr/*EPREL identifier*
Link to product database for the solar-device model included in the package:	

Shower-water heat-recovery device	**Parameter**	**Value**	**Unit**

□			
Number of products in the package:	Shower-water heat-recovery-device factor	x,x	**% points**
Link to solar device model included in the package:	https://eprel.ec.europa.eu/qr/*EPREL identifier*		

ANNEX V

Technical documentation

1. REQUIREMENTS FOR TECHNICAL DOCUMENTATION

1.1. PRODUCTS

The technical documentation referred to in Article 3 shall include:

(a) a general description of the model enabling it to be unequivocally and easily identified;

(b) references to the harmonised standards applied or other measurement standards used;

(c) specific precautions to be taken when the product is assembled, installed, maintained or tested;

(d) the details and the results of calculations performed in accordance with Annex VII;

(e) testing conditions, where they are not described sufficiently in the references provided pursuant to point (b);

(f) a list of all equivalent models, if any, including model identifiers,

(g) the declared values for the technical parameters set out in the tables of Annex IV, to be considered for the purpose of the verification procedure set out in Annex IX:

(i) for fuel boiler heaters – Table 1;

(ii) for electric boiler heaters – Table 2;

(iii) for cogeneration heaters – Table 3;

(iv) for cogeneration heaters with backup boiler – Table 4;

(v) for heat-pump heaters and hybrid heat-pump heaters – Table 5 (in this table, information for high-temperature applications is optional) and the content of Table 6 for each combination of climate and temperature application for which seasonal space-heating energy efficiency is given in Table 5:

(1) for every part-load condition, the complete supplier instructions, of the settings for the electric compressor(s) in terms of Hz or capacity stage and/or burner and/or combustion engine in Hz, rpm, kW heat, or kW engine power respectively, including relevant cycling information;

(2) instructions on control settings for source fan(s), instructions on control settings for circulator(s) speed on the distribution side, and instructions on control settings for the circulator(s) speed on the sink side for testing at part-load condition;

(3) for reversible heat-pump heaters and hybrid heat-pump heaters, the supplier must also provide information set out in Table 7;

(vi) for combination heaters, the information set out in Table 8 must be provided for the load profile declared in accordance with Table 7, Section 6, Annex VII; for outdoor heat pump combination heater, the manufacturer shall provide the information set in Table 8 for average, colder and warmer climate conditions;

(vii) for energy-smart appliances – part A and B, Table 9;

(viii) for temperature controls – Table 10;

(ix) for solar devices – Table 11;

(x) for shower-water heat-recovery devices – Table 12.

If a given parameter is not applicable to the heater, the supplier shall fill in the relevant cell in the table with the expression 'N/A'.

(h) The information provided pursuant to points (a) to (g) shall constitute the mandatory specific parts of the technical documentation that the supplier is to enter in the database, pursuant to Article 12(5) of Regulation (EU) 2017/1369.

(i) Where the information included in the technical documentation for a particular model has been obtained either (i) from a model that has the same technical characteristics relevant for the technical information to be provided but that is produced by a different supplier, or (ii) by calculation based on design or extrapolation from another model of the same or a different supplier, or both, the technical documentation shall include:

(i) the details of the calculation, including a detailed mathematical model;

(ii) the details of the assessment undertaken by the supplier to verify the accuracy of the calculation, including detailed description of any tests undertaken to verify the accuracy of the calculations; and, where appropriate;

(iii) the declaration of identity between the models of different suppliers.

(j) The supplier shall indicate how to access the information that makes possible the independent setting of the units to determine the regulated parameters. This information shall be available upon request to any test laboratories independent from suppliers in less than five days from the date of the request.

1.2. PACKAGES

For packages, the technical documentation referred to in Article 3 shall include:

(a) a general description of the package, allowing it to be unequivocally and easily identified;

(b) references to the harmonised standards applied or other measurement standards used;

(c) specific precautions to be taken when the package and its parts are assembled, installed, maintained or tested;

(d) the details and the results of calculations performed in accordance with Annex VII;

(e) testing conditions, where they are not described sufficiently in the references provided pursuant to point (b);

(f) the declared values for the technical parameters set out in Table 13 for the purpose of the verification procedure set out in Annex IX.

ANNEX VI

Information to be provided in visual advertisements, in promotional material, and in distance selling

1. In visual advertisements, in technical promotional material and in paper-based distance selling and telemarketing, both for products and packages, the model efficiency class and the range of efficiency classes shall be displayed as indicated in Figure 1, and in accordance with the following additional specifications:

   (a) a ‘class arrow’ shall be used, containing the letter indicating the energy efficiency positioned in the centre of the rectangular part of the arrow;

   (b) the class arrow shall have a border, and the internal background colour shall match the colour of the energy-efficiency class in the full label;

   (c) the typeface of the ‘class letter’ shall be Verdana, bold, 100 % white, with an outline in 100 % black and in a size equivalent to that of the price, if the price is shown;

   (d) the typeface of the range of available energy-efficiency classes shall be in Verdana 100 % black on a white background.

Figure 1

Coloured class arrow, with range of energy-efficiency classes

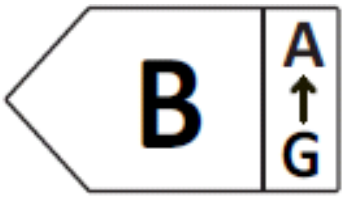
2. By way of derogation from point 1, if the visual advertisement, technical promotional material or paper-based distance selling is printed in monochrome, the energy-efficiency class and the range of energy-efficiency classes may be displayed, as indicated in Figure 2, and points 1 (b) and (c) may be replaced by the following:

   (a) the class arrow shall have a border and the internal background shall be uncoloured, matching the colour of the background support;

   (b) the typeface of the ‘class letter’ shall be Verdana bold, 100 % black, and in a size equivalent to that of the price, if the price is displayed.

Figure 2

Monochrome class arrow, with range of energy-efficiency classes



3. The class-arrow image shall be displayed in proximity to the price of the product.

4. For all the situations referred to in point 1 and 2 above, the customer shall be given access to the full product and package information via a link to the registration of the product in the product database EPREL (as a URL or printed QR code).

5. In visual advertisements, in technical promotional material and in paper-based distance selling and telemarketing on the internet, both for products and for packages, the model efficiency class and the range of efficiency classes shall be displayed as indicated in Figure 1, in accordance with the following additional specifications:

   (a) the class-arrow image shall be the nested display of the full label set out in Annex III and must appear on the first mouse click, mouse roll-over or tactile screen expansion on the image;

   (b) the full label shall be displayed by pop up, new tab, new page or inset screen display;

   (c) for magnification of the label on tactile screens, the device conventions for tactile magnification shall apply;

   (d) the label shall cease to be displayed by means of a close option or other standard closing mechanism;

   (e) the alternative text for the image shall be the energy-efficiency class of the product model;

   (f) a text indicating ‘Product information sheet’ or ‘Package information sheet‘, in proximity to the class arrow, shall give direct access to the product-information sheet as available from EPREL, or to the product-model or package-model page in EPREL.

ANNEX VII

Measurements and calculations

1. INTRODUCTION

For the purposes of verification of conformity and of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards the reference numbers of which have been published for this purpose in the Official Journal of the European Union, or using other reliable, accurate and reproducible methods that consider the generally recognised state-of-the-art methods and are in conformity with the provisions of this Annex and Annex VIII.

Measurements and calculations should be performed using the data provided in accordance with Annex V and additional data required in accordance with this Annex. Where a parameter is declared pursuant to Article 3, its declared value shall be used by the manufacturer, importer, or authorised representative for the calculations in this Annex.

2. CALCULATION OF SEASONAL SPACE-HEATING ENERGY EFFICIENCY ($\eta_{s,h}$)

2.1. Fuel boiler heaters, electric boiler heaters and cogeneration heaters

The seasonal space-heating efficiency $\eta_{s,h,}$ expressed in %, for fuel boiler heaters, electric boiler heaters and cogeneration space-heaters shall be calculated in the following way:

$$\eta_{s,h} = \eta_{son} \times \left(1 - \frac{\sum F(i)}{100\%}\right)$$

where:

– η_{son} is the seasonal space-heating energy efficiency in active mode, calculated in Annex VII, Section 4 hereafter;

– $\Sigma F(i)$ is the sum of the values of correction factors for controls, auxiliary energy and standby heat loss, calculated and applied in accordance with Annex VII, Section 5 hereafter.

2.2. Electric heat-pump heaters and hybrid heat-pump heaters

(a) The seasonal space-heating efficiency $\eta_{s,h,}$ expressed in %, for electric heat-pump heaters shall be calculated in the following way:

$$\eta_{s,h} = \frac{1}{CC} \times SCOP \times \left(1 - \frac{\sum F(i)}{100\%}\right)$$

where:

– CC is the conversion coefficient;

– ΣF(i) is the sum of the values of correction factors for controls and auxiliary energy, calculated in Annex VII, Section 5;

– SCOP is the seasonal coefficient of performance, calculated in accordance with point (b).

(b) The seasonal coefficient of performance (SCOP) shall be calculated in the following way:

$$SCOP = \frac{Q_H}{Q_{HE}}$$

where:

– Q_H is the annual heat demand (in kWh/a), calculated in accordance with point (c);

– Q_{HE} is the annual heating energy consumed (in kWh/a), calculated in accordance with point (d).

(c) The annual heating demand (Q_H) shall be calculated in the following way:

$$Q_H = P_{designh} \times H_{HE}$$

where:

– $P_{designh}$ is the design heat load (in kW), in the reference design conditions set out in Table 1;

– H_{HE} is the equivalent number of annual hours in active mode, set out in Table 2.

(d) The annual heating energy consumed (Q_{HE}) shall be calculated in the following way:

$$Q_{HE} = \frac{Q_H}{SCOP_{on}} + Q_{aux}$$

where:

– Q_H is the annual heat demand (in kWh/a), calculated in the accordance with point (c);

– $SCOP_{on}$ is the active mode coefficient of performance, calculated in Annex VII, Section 4.5;

– Q_{aux} is the additional annual auxiliary electricity consumption, in kWh/a, calculated in accordance with point (e).

(e) The additional annual auxiliary electricity consumption shall be calculated in the following way:

$$Q_{aux} = H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}$$

where:

– H_{TO} are the annual hours in thermostat-off mode, indicated in Table 2;

– H_{SB} are the annual hours in standby mode, indicated in Table 2;

– H_{CK} are the annual hours in crankcase mode, indicated in Table 2;

– H_{OFF} are the annual hours in off mode, indicated in Table 2;

– P_{TO} is the measured power in thermostat-off mode;

– P_{SB} is the measured power in standby mode;

– P_{CK} is the measured power in crankcase mode;

– P_{OFF} is the measured power in off mode.

2.3. Fuel heat-pump heaters

(a) The seasonal space-heating efficiency $\eta_{s,h}$ expressed in %, shall be calculated in the following way:

$$\eta_{s,h} = SPER \times \left(1 - \frac{\Sigma F(i)}{100\%}\right)$$

where:

– ΣF(i) is the sum of the values of correction factors for controls and auxiliary energy, calculated in Annex VII, Section 5;

– SPER is the seasonal primary energy ratio, calculated in the following way:

$$SPER = \frac{1}{\frac{1}{SFUE} + \frac{CC}{SAEF}}$$

where:

– *SFUE* is the seasonal fuel-utilisation efficiency in active mode, calculated in accordance with point 4.6.(c);

– *SAEF* is the seasonal auxiliary electricity factor, calculated in accordance with point (b);

(b) The seasonal auxiliary electricity factor (SAEF) shall be calculated in the following way:

$$\text{SAEF} = \frac{Q_H}{Q_{HElec}}$$

where:

– Q_H is the annual heat demand (in kWh/a), calculated in accordance with point (c);

– Q_{HElec} is the annual electricity consumption (in kWh/a), calculated in accordance with point (d);

(c) The annual heating demand (Q_H) shall be calculated in the following way:

$$\mathrm{Q_H} = \mathrm{P_{designh}} \times \mathrm{H_{HE}}$$

where:

– $P_{designh}$ is the design heat load (in kW), at the reference design conditions set out in Table 1;

– H_{HE} is equivalent number of annual hours in active mode, set out in Table 2;

(d) The annual electricity consumption (Q_{HElec}) shall be calculated in the following way:

$$Q_{HElec} = \frac{Q_H}{SAEF_{on}} + Q_{aux}$$

where:

– Q_H is the annual heat demand (in kWh/a), calculated in the accordance with point (c);

– $SAEF_{on}$ is the active mode coefficient of performance, calculated in accordance with Annex VII, Section 4.5;

– Q_{aux} is the additional annual auxiliary electricity consumption, in kWh/a, calculated in accordance with point (e);

(e) The additional annual auxiliary electricity consumption shall be calculated in the following way:

$$Q_{aux} = H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}$$

where:

– HTO are the annual hours in thermostat off mode, indicated in Table 2;

– HSB are the annual hours in standby mode, indicated in Table 2;

– HCK are the annual hours in crankcase mode, indicated in Table 2;

– HOFF are the annual hours in off mode, indicated in Table 2;

– PTO is the measured power in thermostat off mode;

– PSB is the measured power in standby mode;

– PCK is the measured power in crankcase mode;

– POFF is the measured power in off mode.

Table 1

Heating and cooling outdoor air temperature reference design conditions for reversible heaters, temperatures in dry bulb air temperature (wet bulb air temperature indicated in brackets)

Climate		***Average***	***Warmer***	***Colder***
Reference design conditions for cooling				
Cooling reference design temperature	$T_{designc}$	+ 35 °C	N/A	N/A
For heat-pump heaters and hybrid heat-pump heaters using ventilation exhaust air for cooling, maximum ventilation exhaust air flow rate for space cooling in m³/h at 27 (19) ºC with $P_{designh}$ expressed in kW,	$q_{v,maxc}$	maximum $2.5 * P_{designc}$ / 0.01 m³/h	N/A	N/A
Reference design conditions for heating				
Heating reference design temperature	$T_{designh}$	-10 °C	+ 2 (+1) °C	-22 °C
Bivalent temperature for electric heat-pump heaters (Maximum value)	T_{biv}	+ 2 °C	+ 2 °C	-7 (-8) °C
Temperature operation limit for heat-pump heaters (Maximum value)	*TOL*	-7 (-8) °C	+2 °C	-15 °C
For heat-pump heaters and hybrid heat-pump heaters using ventilation exhaust air, maximum ventilation exhaust air flow rate for space-heating in m³/h at 20 (15) ºC with $P_{designh}$ expressed in kW,	$q_{v,maxh}$	maximum $P_{designh}$ / 0,01 m³/h		

Table 2

Heat-pump heater number of hours used (h/a)

Climate	Cooling function	Heating or cooling	Mode				
			Active	Thermostat-off	Standby	Off	Crankcase heater
			H_{HE} / H_{CE}	H_{TO}	H_{SB}	H_{OFF}	H_{CK}
Average	Heating only	Heating	2066	178	0	3672	3850
	Reversible	Heating	2066	178	0	0	178
	Reversible ($P_{SR,c}$ <= 12 kW)	Cooling	350	221	2142	0	2363
	Reversible ($P_{SR,c}$ > 12 kW	Cooling	600	659	1377	0	2036
Warmer	Heating only	Heating	1336	754	0	4416	5170
	Reversible	Heating	1336	754	0	0	754
Colder	Heating only	Heating	2465	106	0	2208	2314
	Reversible	Heating	2465	106	0	0	106

3. CALCULATION OF PARAMETERS FOR ACTIVE MODE: SEASONAL SPACE-HEATING ENERGY EFFICIENCY IN ACTIVE MODE (η_{son}), SEASONAL AUXILIARY ELECTRICITY FACTOR IN ACTIVE MODE ($SAEF_{ON}$) AND SEASONAL FUEL-UTILISATION FACTOR (SFUE)

3.1. Fuel boiler heaters

The seasonal space-heating efficiency η_{son}, expressed in %, for the fuel boiler heaters, shall be calculated in the following way:

$$\eta_{son} = 0.85 \times \eta_1 + 0.15 \times \eta_4,$$

where:

– η_1 is the efficiency at 30% of the standard-rated heat input P_{hs};

– η_4 is the efficiency at standard-rated heat input P_{hs}.

3.2. Electric boiler heaters

The seasonal space-heating efficiency η_{son}, expressed in %, for the fuel boiler heaters, shall be calculated in the following way:

$$\eta_{son} = \eta_4,$$

where η_4 is the useful efficiency at standard-rated heat output P_4, calculated in the following way:

$$\eta_4 = \frac{P_4}{EC \times CC}$$

where:

– P_4 is the standard-rated heat output expressed in kW;

– EC is the electric power consumption to produce the standard-rated heat output P_4;

– CC is the conversion coefficient.

3.3. Cogeneration space heaters

The seasonal space-heating efficiency η_{son}, expressed in %, for cogeneration heaters, shall be calculated in the following way:

$$\eta_{son} = \frac{P_4 + 2.65 \times P_{el}}{P_{hs}},$$

where:

– P_4 is the standard-rated heat output expressed in kW;

– P_{el} is the standard-rated electric power output expressed in kW;

– P_{hs} is the standard-rated heat input in GCV of the fuel input in kW.

3.4. Cogeneration space heater with fuel backup heater

(a) The seasonal space-heating efficiency η_{son}, expressed in %, for cogeneration heater with fuel backup heater, shall be calculated in the following way:

$$\eta_{son} = 0.85 \times \eta_1 + 0.15 \times \eta_4,$$

where:

– η_1 is the efficiency at 30 % of the standard-rated heat output P_4, calculated in accordance with point (b);

– η_4 is the efficiency at standard-rated heat output P_4;

(b) η_1 shall be calculated in the following way:

(i) For a cogeneration heater with fuel backup heater, for which the maximum output of the cogeneration heat generator in 30/50 temperature regime is equal to or higher than 30% of P_4:

$$\eta_1 = \eta_{CHP} = \frac{P_{CHP} + 2.65 \times P_{el\_CHP}}{P_{input\_CHP}},$$

where:

– η_{CHP} is the efficiency of the cogeneration heater alone in 30/50 temperature regime;

– P_{CHP} is the heat output, when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime, expressed in kW;

– P_{el_CHP} is the rated electric power output, when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime, expressed in kW;

– P_{input_CHP} is the heat input power in GCV of the liquid fuel or gaseous fuel input of the cogeneration, when only the cogeneration heat generator is supplying heat, in a 30/50 temperature regime, expressed in kW.

(ii) For a cogeneration heater with a fuel backup heater, for which the maximum output of the cogeneration heat generator in a 30/50 temperature regime is lower than 30% of P_4:

$$\eta_1 = \frac{0.3}{\frac{P_{CHP} \times \alpha}{P_4 \times \eta_{CHP}} + \frac{(1-\alpha)}{\eta_4}}$$

where α is the proportion of the time the cogeneration heat generator is supplying heat alone in order to reach 30% of the standard-rated heat output, in a 30/50 temperature regime, calculated as follows:

$$\alpha = \frac{1 - 0.3}{1 - \frac{P_{CHP}}{P_4}}$$

3.5. Electric heat-pump heaters and hybrid heat-pump heaters

(a) The active-mode seasonal coefficient of performance $SCOP_{on}$ is calculated in the following way:

$$SCOP_{on} = \frac{\sum_{j=1}^{n} h_j \times P_h(T_j)}{\sum_{j=1}^{n} h_j \left[\frac{P_h(T_j) - P_{add}(T_j)}{COP_{bin}(T_j)} + \mathrm{Input}_{\mathrm{add}}(T_j)\right]}$$

where:

– h_j is frequency of outdoor temperature in the temperature bin j, expressed in hours;

– $P_h(T_j)$ is the part-load for heating, calculated in accordance with point (b);

– $P_{add}(T_j)$ is the additional heat output required to be supplied by the backup heater, when the electric heat-pump heater is not able to supply $P_h(T_j)$ on its own, calculated in accordance with point (c);

– $Input_{add}(T_j)$ is the additional energy input consumed by the backup heater, calculated in accordance with point (d);

– $COP_{bin}(T_j)$ is the bin-specific coefficient of performance, calculated in accordance with point (e).

(b) The part-load for heating $P_h(T_j)$ shall be calculated as follows:

$$P_h(T_j) = P_{design,h} \times pl(T_j)$$

where:

– $P_{design,h}$ is the design load;

– $pl(T_j)$ is the part-load ratio.

(c) The additional heat output ($P_{add}(T_j)$) shall be calculated in the following way:

(i) for heat-pump heaters without backup heater it is equal to 0;

(ii) for electric heat-pumps with electric backup heater, it is the power output of the electric backup heater:

$P_{add}(T_j) = elbu(T_j)$

(iii) for hybrid heat-pump heaters, it is the heat output of the fuel backup heater:

$P_{add}(T_j) = fuelbu(T_j)$

(d) The additional final energy input ($Input_{add}(T_j)$) shall be calculated in the following way:

(i) for heat-pump heaters it is equal to 0;

(ii) for electric heat-pump heater with electric backup heater, it is the power input to the electric backup heater and is equal to the heat output of the backup heater supposing a heating efficiency of 1 for the electric backup heater:

$$P_{add}(T_j) = elbu(T_j)$$

(iii) for hybrid heat-pump heaters, it is the heat input to the fuel backup heater:

$$Input_{add}(T_j) = \frac{fuelbu(T_j)}{\eta_{s,h\_fuelbu} \times \frac{1}{cc}} \times (1 - F(1)),$$

where:

– fuelbu(Tj) is the bin-specific heat output of the fuel backup heater;

– η_{s,h_fuelbu} is the seasonal space-heating efficiency of the fuel backup heater;

– F(1) is the control correction factor defined in Section 5.1.

(e) Declared values for $COP_d(T_j)$ and $P_{dh}(T_j)$ are the measured values at the part-load test conditions for outdoor temperatures T_j ('bins') A to G and $P_{design,h}$, as indicated in Table 3. The values for $COP_{bin}(T_j)$ shall be determined through interpolation and extrapolation of known values. If the heat-pump capacity is higher than the heat demand in a bin by more than 10 %, the heat-pump will cycle on/off and a degradation factor (C_{dh}) and a capacity ratio (CR) have to be used to calculate the COP_{bin} for T_j in the following way:

$$COP_{bin} = \frac{COP_d \times CR}{C_{dh} \times CR + (1 - C_{dh})}$$

where:

– CR is the capacity ratio, calculated in accordance with point (f);

– C_{dh} is the degradation coefficient for cycling behaviour; it is either 0.9 by default or it can be determined by a series of cyclic tests; it is then calculated as the ratio between the power during the off phase divided by the power during the on phase.

For cycling, the water temperature regime in the on phase is modified to maintain the same average water-temperature regime over the whole on/off cycle as in the stationary condition without cycling.

(f) The capacity ratio CR for the purposes of point (e) is calculated in the following way:

$$CR = pl(T_j) \times \frac{P_{designh}}{P_{dh}}$$

where:

– $Pl(T_j)$ is the part-load ratio;

– $P_{designh}$ is the design load;

– P_{dh} is the minimum capacity for heating in continuous operation.

(g) Test method for hybrid heat pumps

– The seasonal space-heating energy efficiency ($\eta_{s,h}$) of hybrid heat-pump heaters may be determined by testing the heating capacity and the efficiencies of the two heat generators (fuel boiler, electric heat-pump) separately, as long as this separate method does not deviate significantly from the results obtained with the joint

method, in which the two heat generators are both working at the various test points according to the hybrid controller.

– For a separate determination, the tests for the heat-pump part of the hybrid heat-pump heater shall be conducted with only the heat-pump in operation and the other heat generator comprising the hybrid heat-pump heater hydraulically connected, for part-load conditions set out in Table 3 of this Annex, for outdoor temperature conditions greater or equal to $T_{hp,on}$.

– For a joint approach of hybrid heat-pump heaters:

(i) the seasonal performance is calculated using a method similar to the one used for heat-pumps alone;

(ii) the hybrid heater is tested at the various temperature and load conditions required for the specific climate and temperature level application; electricity consumption and fuel consumption are registered separately;

(iii) the calculation of $\eta_{s,h}$ is based on the interpolation at each bin temperature of the heating capacity and energy input of the hybrid unit between values at the tested part-load conditions.

3.6. Seasonal auxiliary electricity factor in active mode ($SAEF_{on}$) and seasonal fuel utilisation factor (SFUE) for fuel heat-pump heaters

(a) The seasonal auxiliary electricity factor in active mode (SAEFon) shall be calculated in the following way:

$$SAEF_{on} = \frac{\sum_{j=1}^{n} h_j \times P_h(T_j)}{\sum_{j=1}^{n} h_j \left[\frac{P_h(T_j)}{AEF(T_j)}\right]}$$

where:

– h_j is frequency of outdoor temperature in the temperature bin j, expressed in hours;

– $P_h(T_j)$ is the part load for heating, calculated in accordance with point (b);

– $AEF(T_j)$ is the ratio between the part load $P_h(T_j)$ and the electric power input at a specific outdoor temperature T_j, expressed in kW/kW.

(b) The part load for heating $P_h(T_j)$ shall be calculated as follows:

$$P_h(T_j) = \frac{P_{design,h}}{pl(T_j)}$$

Where:

– $P_{design,h}$ is the design load;

– $pl(T_j)$ is the part load ratio.

(c) The seasonal fuel-utilisation efficiency (SFUE) shall be calculated as follows:

$$SFUE = \frac{\sum_{j=1}^{n} h_j \times P_h(T_j)}{\sum_{j=1}^{n} h_j \left[\left(\frac{P_h(T_j)}{FUE(T_j)} - P_{add}(Tj)\right) + Input_{add}(Tj)\right]}$$

where:

– h_j is frequency of outdoor temperature in the temperature bin j, expressed in hours;

– $P_h(T_j)$ is the part load for heating, calculated in accordance with point (d);

– $FUE(T_j)$ is the ratio between the part load $Ph(T_j)$ and the measured thermal input in GCV at a specific outdoor temperature T_j, expressed in kW/kW;

– $P_{add}(T_j)$ is the additional heat output required to be supplied by the backup heater, when the fuel heat-pump is not able to supply Ph(Tj) on its own, calculated in accordance with point (d);

– $Input_{add}(T_j)$ is the additional energy input consumed by the backup heater, calculated in accordance with point (e).

(d) The additional heat output $P_{add}(T_j)$ shall be calculated in the following way:

(i) if there is no backup, it is equal to 0;

(ii) for fuel heat pumps with fuel backup heater:

$$P_{add}(T_j) = fuelbu(T_j)$$

(e) The additional final energy input ($Input_{add}(T_j)$) shall be calculated in the following way:

(i) if there is no backup, it is equal to 0;

(ii) for fuel heat pumps with fuel backup heater:

$$Input_{add}(T_j) = \frac{fuelbu(T_j)}{\eta_{s,h\_fuelbu}} \times (1 - F(1)),$$

where:

– $P_{sup}(Tj)$ is the bin-specific heat output of the fuel backup heater;

– η_{s,h_fuelbu} is the seasonal space-heating efficiency of the fuel backup heater;

– F(1) is the control correction factor defined in Section 5.1.

(f) Declared values for $FUE_d(T_j)$ and $P_{dh}(T_j)$ are the measured values under the part-load test conditions for outdoor temperatures T_j ('bins') A to F and $P_{designh}$, as indicated in Table 3. The values for $FUE(T_j)$ shall be determined through interpolation and extrapolation of known values. If the heat-pump capacity in a bin is too high for the heat demand in the bin by more than 10%, the heat pump will cycle on/off and a degradation factor (C_{dh}) and a capacity ratio (CR) has to be used to calculate the FUE for T_j in the following way:

$$FUE_{bin}(T_j) = \frac{FUE(T_j) \times CR}{C_{dh} \times CR + (1 - C_{dh})}$$

where:

– $FUE(T_j)$ is the declared coefficient of performance, calculated in accordance with point (f) above;

– CR is the capacity ratio, calculated in accordance with point (f);

– C_{dh} is the degradation coefficient for cycling behaviour; either a default value can be used or the degradation coefficient can result from cyclic tests.

In case of cycling, the stationary water temperature regime is modified to maintain the same time-average water-temperature regime over the whole on/off cycle.

(g) The capacity ratio CR for the purposes of point (e) is calculated in the following way:

$$CR = pl(T_j) \times \frac{P_{designh}}{P_{dh}}$$

where:

– $Pl(T_j)$ is the part-load ratio;

– $P_{designh}$ is the design load;

– P_{dh} is the minimum capacity for heating in continuous operation.

Table 3

Part-load test conditions for heat-pump heaters

Test	**Part-load ratio**			**Outdoor air****	**Indoor**	**Variable outlet temperature °C**			**Mean temperature* °C**		
#	***A* %**	***W* %**	***C* %**	***Inlet dry (wet) bulb °C***	**appli-cation**	***A* °C**	**W °C**	***C* °C**	***A* °C**	**W °C**	***C* °C**
A	88	n.a.	61	−7(−8)	LT	**/34	n.a.	**/30	31.3	n.a.	27.2
					MT	**/52	n.a.	**/44	47.8	n.a.	39.7
					HT	**/61	n.a.	**/50	55.8	n.a.	44.7
B	54	100	37	2(1)	LT	**/30	**/35	**/27	27.2	32.3	24.0
					MT	**/42	**/55	**/37	37.7	50.8	32.6
					HT	**/49	**/65	**/41	43.6	59.8	35.5
C	35	64	24	7(6)	LT	**/27	**/31	**/25	24.0	28.2	22.9
					MT	**/36	**/46	**/32	31.5	41.8	27.3
					HT	**/41	**/53	**/36	35.5	47.7	30.2
D	15	29	11	12(11)	LT	**/24	**/26	**/24	21.9	22.8	21.3
					MT	**/30	**/34	**/28	25.0	29.4	23.2
					HT	**/32	**/39	**/30	25.6	33.4	24.2
E ***	var	var	var	TOL	all	***/***	***/***	***/***	***/***	***/***	***/***
F ***	var	var	var	T_{biv}	all	***/***	***/***	***/***	***/***	***/***	***/***

*										
G	n.a.	n.a.	82	−15	LT	n.a.	n.a.	**/32	n.a.	n.a.	29.3
					MT	n.a.	n.a.	**/49	n.a.	n.a.	44.8
					HT	n.a.	n.a.	**/57	n.a.	n.a.	51.7

Legend: 'var' means dependent on specific product characteristics; 'Test #' means test condition; 'A' average climate; 'W' warmer climate; 'C' colder climate;'n.a.' means non applicable

*: For variable flow units, the manufacturer may apply a higher leaving water temperature as long as the mean temperature of the test condition is maintained. The mean temperature is calculated as the mean logarithmic temperature difference between the indoor air temperature of 20 °C and the leaving and returning water temperatures when using variable temperature, fixed outlet, and variable flow. If the return temperature is lower than 20°C, the mean temperature is the sum of 20 °C and the part-load ratio of the specific test point multiplied by the logarithmic temperature difference at Tdesignh of the specific climate.

**: With the flow rate as determined in the standard rating conditions at 30/35 for LT applications (respectively at 47/55 for MT applications and 55/65 for HT applications) for units with a fixed flow rate, and with a fixed water-temperature difference of 5 K (respectively of 8 K and 10 K) for units with a variable flow rate. For variable water flow, if the flow obtained from the 5 K (respectively 8 K and 10 K) temperature difference between the outlet and return temperature is lower than the minimum flow indicated by the manufacturer, than this latter value should be used. If cycling occurs, the feed temperature changes (increases) to the adjusted outlet temperature for cycling '(Tcyc(Tj))'. Tcyc(Tj) is such that the average leaving temperature over the on and off periods equals the outlet temperature for units operating continuously at the same part-load condition. Alternatively, the average of the on and off periods is equal to the mean temperature for units operating continuously at the same part-load condition.

*** = calculated from interpolation of supply/return temperatures (respectively of the mean temperature) at test conditions higher and lower than and closest to T_{biv} or TOL where relevant.

****: Notes on conditions E and F: If TOL > Tdesignh, Tdesignh can only be reached with an electric backup heater elbu. If TOL < Tdesignh then TOL is considered equal to Tdesignh and this test condition and E (TOL) are identical.

***** For other heat sources, the conditions for the outdoor heat exchanger are as follows:

- Ground heat exchanger: inlet 5 C°/outlet: dependent on operating conditions

- Exhaust air: inlet air dry (wet) bulb 20 (15) °C/outlet: dependent on operating conditions

- Ground direct exchange: bath temperature 4 °C.

For ground heat exchangers, the flow rate is set to the value determined in the standard rating conditions for units with a fixed flow rate or with a fixed water temperature difference of 3 K for units with a variable flow rate. For variable water flow, if the flow obtained from the 3 K temperature difference between the return and outlet temperatures is lower than the minimum flow indicated by the manufacturer, than this latter value should be used.

Table 4

European reference heating season under average, colder, and warmer climate conditions for heat-pump heaters and hybrid heat-pump heaters

Climate conditions	bin_j	1 to 8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	T_j [°C]	–30 to –23	–22	–21	–20	–19	–18	–17	–16	–15	–14	–13	–12	–11	–10	–9	–8	–7	–6	–5	–4	–3
Average	H_j [h/a]														1	25	23	24	27	68	91	89
Colder	H_j [h/a]		1	6	13	17	19	26	39	41	35	52	37	41	43	54	90	125	169	195	278	306
Warmer	H_j [h/a]																					

Climate conditions	bin_j	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	Total hours (H):
	T_j [°C]	–2	–1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Average	H_j [h/a]	165	173	240	280	320	357	356	303	330	326	348	335	315	215	169	151	105	74	**4 910**
Colder	H_j [h/a]	454	385	490	533	380	228	261	279	229	269	233	230	243	191	146	150	97	61	**6 446**
Warmer	H_j [h/a]					3	22	63	63	175	162	259	360	428	430	503	444	384	294	**3 590**

4. CONTROL, AUXILIARY ENERGY AND STANDBY HEAT-LOSS CORRECTION FACTORS

4.1. Control correction factor F(1)

1. The control correction factor F(1) is shall apply to all heaters.

2. The value of the control correction factor F(1) is equal to 3 percentage points.

4.2. Auxiliary electricity correction factor F(2)

The value of the auxiliary electricity correction factor *F(2)* shall be expressed in percentage points and shall be calculated in the following way:

(a) for fuel boiler heaters :

$$F(2) = CC \times \frac{(0.15 \times elmax + 0.85 \times elmin + 1.3 \times PSB)}{(0.15 \times P4 + 0.85 \times P1)}$$

where:

– *CC* is the conversion coefficient;

– *elmax* is the full load auxiliary power, meaning electric power consumption, as part of the electric auxiliary energy, at full load P4 of a fuel boiler heater, expressed in kW;

– *elmin* is the part-load auxiliary power, meaning the electric power consumption, as part of the electric auxiliary energy, at part-load P1 of a fuel boiler heater, expressed in kW;

– P_{SB} is the standby-mode power consumption, meaning the electric power consumption of a heater in standby mode, including network standby, expressed in kW;

– *P4* is the standard-rated heat output expressed in kW;

– *P1* is the part-load output expressed in kW.

(b) for electric boiler heaters:

$$F(2) = \frac{1.3 \times P_{SB}}{P_4 \times CC}$$

where:

– P_{SB} is the standby-mode power consumption, meaning the electric power consumption of a heater in standby mode, including network standby, expressed in kW;

– *P4* is the standard-rated heat output expressed in kW;

– *CC* is the conversion coefficient.

(c) for cogeneration space-heaters and cogeneration heater with backup boiler :

$$\underline{F(2)} = \frac{CC \times elmax}{P_4}$$

where:

– *elmax* is the full-load auxiliary power, meaning electric power consumption, as part of the electric auxiliary energy, at full load P4 of a fuel boiler heater, expressed in kW;

– *P4* is the standard-rated heat output expressed in kW;

– *CC* is the conversion coefficient.

(d) for ground heat exchanger heat-pump heaters and hybrid heat-pump heaters comprising ground heat exchanger heat-pump heat generator:

$$F(2) = 5$$

4.3. Standby heat loss correction factor F(3)

The standby heat-loss correction *F(3)* shall be expressed in percentage points and shall calculated in the following way:

(a) for boiler heaters:

$$F(3) = \frac{0.5 \times P_{h.l}}{P_4}$$

where:

– $P_{h,l}$ is the heat loss of a boiler heater in operating modes without heat demand, expressed in kW;

– P_4 is the standard-rated heat output expressed in kW.

(b) for other heaters

$$F(3) = 0$$

5. WATER-HEATING ENERGY EFFICIENCY FOR COMBINATION HEATERS

5.1. Water heating test conditions

1. The water-heating tests are performed in the 'out of the box mode'. The only alteration allowed is to enable the measurement of the adaptive-control factor.

2. The declared load profile of a combination heater and the ability of a combination heater to supply water at 50 °C for all declared profiles and climates shall be verified by tests, before proceeding with the remaining water heating measurements.

3. The water-heating measurements shall be carried out for the load profile with the largest reference energy (Qref) that can be supplied by the combination heater, as set out in Table 7.

4. For measurements under point 4, the cold sanitary water inlet temperature is +10 °C and the ambient temperature is +20 °C if the combination heater is designated for use in a heated space. If the combination heater is designated for use in an unheated space, then it shall be tested at the ambient temperature outdoors or, for heat-pump combination heaters, at the source air temperature.

5. The tests to determine energy efficiency and performance are subject to the following conditions:

   (i) measurements shall be carried out using the load profiles set out in Table 7;

   (ii) measurements shall be carried out using a 24-hour measurement cycle as follows:

   (iii) 00:00 to 06:59: no water draw-off;

   (iv) from 07:00: water draw-offs according to the declared load profile;

   (v) from end of last water draw-off until 24:00: no water draw-off.

6. During the test for determining water heating efficiency no space heating may occur. If the heater is equipped with a PFHRD for the recovery of heat resulting from a space-heating operation, the parameter Qfuel for the calculation of water heating efficiency shall be corrected to reflect possible savings, considering the conversion from heat recovered to final energy saved and the relative weight of the heating season in annual operation.

7. When testing with a passive flue heat recovery device (PFHRD), from 06:00 to 21:30 of the profile reference time and when the boiler heater is not performing its water-heating function, the boiler heater shall continuously operate in heating mode with a feed temperature of 43 °C and a return temperature of 37 °C. The daily fuel energy consumption for water heating shall be calculated, by taking proportionally into account fuel consumption in summer mode (166 of 366 days, test without intermediate space heating) and winter mode (200 of 366 days, test with intermediate space heating).

8. Heat-pump combination heaters shall be tested under the conditions set out in Table 5.

9. Heat-pump combination heaters which use ventilation exhaust air as the heat source shall be tested under the conditions set out in Table 6, whereby an alternate source is to be used and declared, if and in as much as the ventilation exhaust air is not enough to perform the requirements of the declared load profile.

10. Combination heaters classified as off-peak combination heaters shall be energised for a maximum period of 8 consecutive hours between 22:00 and 07:00 of the 24-hour tapping pattern. At the end of the 24-hour tapping pattern the combination heaters are energised until the end of the step.

11. For calculating the adaptive-control factor FAC, measurements of the weekly electricity and/or fuel consumption with or without adaptive controls shall be carried out using a two-week measurement cycle as follows:

    (i) days 1 to 5: random sequence of load profiles chosen from the declared load profile and the load profile one below the declared load profile, self-learning function enabled, and adaptive control disabled;

    (ii) days 6 and 7: no water draw-offs, self-learning function enabled, and adaptive control disabled;

    (iii) days 8 to 12: repetition of the same sequence applied for days 1 to 5, and adaptive control enabled;

    (iv) days 13 and 14: no water draw-offs, and adaptive control enabled.

12. The difference between the useful energy content measured during days 1 to 7 and the useful energy content measured during days 8 to 14 shall not exceed 2 % of Q_{ref} of the declared load profile.

13. Standing losses of hot water storage tanks shall be measured at an ambient temperature of 20 °C and a storage temperature of 65 °C to be achieved and maintained during the test.

14. For tests and test conditions not mentioned here, the transitional methods mentioned in Annex VIII apply, as appropriate.

Table 5

Heating standard rating conditions for heat-pump combination water heating: dry bulb air temperatures (wet-bulb temperatures in brackets) and liquid temperatures*

Heat source	Outdoor air	Outdoor air	Outdoor air	Exhaust air	Ground heat exchanger	Ground direct exchange, bath temperature
Climate conditions	Average climate	Colder climate	Warmer climate	All climates		
Temperature (dry bulb / wet bulb)	+7 °C/+6 °C	+2 °C/+1 °C	+14 °C/+12 °C	+20 °C (+15 °C)	+5 °C (inlet)/ +2 °C (outlet)	+ 4 °C

Table 6

Maximum ventilation exhaust air flow rate available for water heating [$q_{v,max\ w}$] at various loads in m³/h, at 20(15)°C dry(wet) bulb

Declared load profile	**S**	**M**	**L**	**XL**	**XXL**	**3XL**	**4XL**

Ventilation exhaust air flow rate available for water heating $q_{v,max\ w}$ in m³/h	80	160	190	600	900	1700	3500

5.2. Water-heating energy efficiency (η_{wh}) calculation method

(a) The water heating energy efficiency η_{wh}, expressed in %, of a combination heater shall be calculated as the ratio between the reference energy Q_{ref} of the declared load profile and the energy required for its generation based on GCV and including primary energy for electricity, calculated as:

$$\eta_{wh} = \frac{Q_{ref}}{\left(Q_{fuel} + CC \cdot Q_{elec}\right) \cdot (1 - F_{AC}) + Q_{cor}} \cdot 100$$

where:

– Q_{ref} is the total energy delivered by the load profile used, value from Table 7, in kWh;

– Q_{elec} is the consumption of electricity for water heating over 24 consecutive hours under the declared load profile, expressed in kWh, in terms of final energy, including the electricity use of auxiliary components that are necessary for testing the load profile but not delivered with the product (except the water circulator(s));

– Q_{fuel} is the daily fuel consumption for domestic hot water over 24 consecutive hours under the declared load profile, expressed in kWh, in terms of GCV;

– F_{AC} is the adaptive control factor, as set out in point (b);

– Q_{cor} is the ambient correction term, as set out in point (c).

(b) The adaptive-control factor:

(i) for combination heaters without adaptive control is equal to 0;

(ii) for combination heaters with adaptive control is calculated in the following way:

$$F_{AC} = 1 - \frac{Q_{fuel,week,adaptive} + CC \times Q_{elec,week,adaptive}}{Q_{fuel,week} + CC \times Q_{elec,week}}$$

(iii) If the result of the calculation is ≥ 0.07 the difference between the useful energy content measured during days 1 to 7 and the useful energy content measured during days 8 to 14 does not exceed 2% of Q_{ref} of the declared load profile the value of F_{AC} is rounded up to 1, and in other cases, the value of F_{AC} is rounded down to 0;

Measurements $Q_{fuel,week,adaptive}$, $Q_{elec,week,adaptive}$, $Q_{fuel,week}$ and $Q_{elec,week}$ shall be carried out in accordance with Section 6.1 point (h).

(c) Q_{cor}:

(i) for water heaters with load profiles XL to 4XL is equal to 0;

(ii) for water heaters with load profiles S to L is calculated in the following way:

(1) for heat-pump water heaters:

$$Q_{cor} = -0.23 \times 24h \times P_{stby}$$

(2) for water heaters other than heat-pumps, using fuel combustion for heating sanitary water:

$$Q_{cor} = -0{,}23 \cdot (Q_{fuel} \cdot (1 - F_{AC}) - Q_{ref})$$

(3) for water heaters other than heat-pumps, using the electric Joule effect for heating sanitary water:

$$Q_{cor} = -0{,}23 \cdot (CC \cdot Q_{elec} \cdot (1 - F_{AC}) - Q_{ref})$$

Table 7

Water-heating tapping (load) profiles 3XS, XXS, XS, S, M, L, XL, XXL, 3XL, 4XL

h	3XS			XXS			XS			S				M			
	Q_{tap}	f	T_m	Q_{tap}	f	T_m	Q_{tap}	f	T_m	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p
	kWh	l/ min	°C	kWh	l/ min	°C	kWh	l/ min	°C	kWh	l/ min	°C	°C	kWh	l/ min	°C	°C
07:00	**0.015**	2	25	**0.105**	**2**	**25**				**0.105**	3	25		**0.105**	3	25	
07:05	**0.015**	2	25											**1.4**	6	40	
07:15	**0.015**	2	25														
07:26	**0.015**	2	25														
07:30	**0.015**	2	25	**0.105**	**2**	**25**	**0.525**	3	35	**0.105**	3	25		**0.105**	3	25	
08:01														**0.105**	3	25	
08:15														**0.105**	3	25	
08:30				**0.105**	2	25				**0.105**	3	25		**0.105**	3	25	
08:45														**0.105**	3	25	
09:00	**0.015**	2	25											**0.105**	3	25	
09:30	**0.015**	2	25	**0.105**	2	25				**0.105**	3	25		**0.105**	3	25	
10:30														**0.105**	3	10	40
11:30	**0.015**	2	25	**0.105**	2	25				**0.105**	3	25		**0.105**	3	10	40
11:45	**0.015**	2	25	**0.105**	2	25				**0.105**	3	25		**0.105**	3	25	
12:00	**0.015**	2	25	**0.105**	2	25											
12:30	**0.015**	2	25	**0.105**	2	25											
12:45	**0.015**	2	25	**0.105**	2	25	**0.525**	3	35	**0.315**	4	10	50	**0.315**	4	10	50
14:30	**0.015**	2	25											**0.105**	3	25	

15:00	**0.015**	2	25									
15:30	**0.015**	2	25								**0.105**	3	25
16:00	**0.015**	2	25									
16:30											**0.105**	3	25
18:00				**0.105**	2	25			**0.105**	3	25	**0.105**	3	25
18:15				**0.105**	2	25			**0.105**	3	40	**0.105**	3	40
18:30	**0.015**	2	25	**0.105**	2	25						**0.105**	3	40
19:00	**0.015**	2	25	**0.105**	2	25						**0.105**	3	25
19:30	**0.015**	2	25	**0.105**	2	25								
20:00				**0.105**	2	25								
20:30							**1.05**	3	35	**0.42**	4	10 50	**0.735**	4	10 50
20:45				**0.105**	2	25								
21:00				**0.105**	2	25								
21:15	**0.015**	2	25	**0.105**	2	25						**0.105**	3	25
21:30	**0.015**	2	25							**0.525**	5	40	**1.4**	6	40
21:35	**0.015**	2	25	**0.105**	2	25								
21:45	**0.015**	2	25	**0.105**	2	25								
Q_{ref}	**0.345**			**2.100**			**2.100**			**2.100**			**5.845**		

h	L				XL				XXL				h	3XL			
	Q_{tap}	f	T_m	T_p	Q_{tap}	F	T_m	Q_{tap}	f	T_m	f	T_m		Q_{tap}	f	T_m	T_p
	kWh	l/ min	°C	°C	kWh	l/ min	°C	°C	kWh	l/ min	°C	°C		kWh	l/ min	°C	°C
07:00	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		07:00	**11.2**	48	40	
07:05	**1.4**	6	40										08:01	**5.04**	24	25	
07:15					**1.82**	6	40		**1.82**	6	40		09:00	**1.68**	24	25	
07:26					**0.105**	3	25		**0.105**	3	25		10:30	**0.84**	24	10	40
07:30	**0.105**	3	25										11:45	**1.68**	24	25	
07:45	**0.105**	3	25		**4.42**	10	10	40	**6.24**	16	10	40	12:45	**2.52**	32	10	50
08:01					**0.105**	3	25		**0.105**	3	25		15:30	**2.52**	24	25	
08:05	**3.605**	10	10	40									18:30	**3.36**	24	25	
08:15					**0.105**	3	25		**0.105**	3	25		20:30	**5.88**	32	10	50
08:25	**0.105**	3	25										21:30	**12.04**	48	40	
08:30	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		Q_{ref}	**46,76**			
08:45	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25						
09:00	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25			**4XL**			
09:30	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		**h**	Q_{tap}	f	T_m	T_p
10:00					**0.105**	3	25		**0.105**	3	25			kWh	l/ min	°C	°C
10:30	**0.105**	3	10	40	**0..105**	3	10	40	**0.105**	3	10	40					
11:00					**0.105**	3	25		**0.105**	3	25		07:00	**22.4**	96	40	

11:30	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		08:01	**10.08**	48	25	
11:45	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		09:00	**3.36**	48	25	
12:45	**0.315**	4	10	50	**0.735**	4	10	50	**0.735**	4	10	50	10:30	**1.68**	48	10	40
14:30	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		11:45	**3.36**	48	25	
15:00					**0..105**	3	25		**0.105**	3	25		12:45	**5.04**	64	10	50
15:30	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		15:30	**5.04**	48	25	
16:00					**0.105**	3	25		**0.105**	3	25		18:30	**6.72**	48	25	
16:30	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		20:30	**11.76**	64	10	50
17:00					**0.105**	3	25		**0.105**	3	25		21:30	**24.08**	96	40	
18:00	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		*Q_{ref}*	**93.52**			
18:15	**0.105**	3	40		**0.105**	3	40		**0.105**	3	40						
18:30	**0.105**	3	40		**0.105**	3	40		**0.105**	3	40		*Legend:*				
19:00	**0.105**	3	25		**0.105**	3	25		**0.105**	3	25		*Qtap:* energy content				
20:30	**0.735**	4	10	50	**0.735**	4	10	50	**0.735**	4	10	50	*f :* flow rate				
20:46					**4.42**	10	10	40	**6.24**	16	10	40	*Tm:* minimum temperature				
21:00	**3.605**	10	10	40									*Tp: draw-off* temperature				
21:15					**0.105**	3	25		**0.105**	3	25						
21:30	**0.105**	3	25		**4.42**	10	10	40	**6.24**	16	10	40					
Q_{ref}	**11.655**				**19.07**				**24.53**								

6. SEASONAL SPACE-COOLING ENERGY EFFICIENCY

6.1. Seasonal space-cooling energy efficiency of electric reversible heat-pump heaters and hybrid heat-pump heaters with electric heat-pump heat generators

(a) The seasonal space cooling energy efficiency $\eta_{s,c}$ shall be calculated in the following way:

$$\eta_{s,c} = \frac{1}{CC} \times SEER \times (1 - \sum F(i))$$

where:

– SEER is the seasonal energy-efficiency ratio, calculated in accordance with point (b);

– CC is the conversion coefficient;

– ΣF(i) is the sum of the values of F(1) and F(2), where:

  – F(1) is the control correction factor, calculated in accordance with Section 5.1.;

  – F(2) is the auxiliary electricity correction factor, calculated in accordance with Section 5.2. point (d).

(b) The seasonal energy-efficiency ratio SEER shall be calculated in the following way:

$$SEER = \frac{Q_C}{Q_{CE}}$$

where:

– Q_C is the reference annual cooling demand, calculated in accordance with point (c);

– Q_{CE} is the reference annual energy consumption for cooling, calculated in accordance with point (d).

(c) The reference annual cooling demand Q_C shall be calculated as follows:

$$Q_C = P_{designc} \times H_{CE}$$

where:

– $P_{design,c}$ is the design cooling load;

– H_{CE} is the equivalent active mode hours for cooling, as set out in Table 2,

(d) The reference annual energy consumption for cooling Q_{CE} shall be calculated as follows:

$$Q_{CE} = \frac{Q_C}{SEER_{on}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}$$

where:

– Q_C is the reference annual cooling demand;

– $SEER_{on}$ is the active mode energy-efficiency ratio, calculated in accordance with point (e);

– H_{TO} are the annual hours in thermostat off mode, indicated in Table 2;

– H_{SB} are the annual hours in standby mode, indicated in Table 2;

– H_{CK} are the annual hours in crankcase mode, indicated in Table 2;

– H_{OFF} are the annual hours in off mode, indicated in Table 2;

– P_{TO} is the measured power in thermostat off mode;

– P_{SB} is the measured power in standby mode;

– P_{CK} is the measured power in crankcase mode;

– P_{OFF} is the measured power in off mode.

(e) The active mode seasonal energy-efficiency ratio $SEER_{on}$ shall be calculated as follows:

$$SEER_{on} = \frac{\sum_{j=1}^{n} h_j \times P_c\left(T_j\right)}{\sum_{j=1}^{n} h_j \left(\frac{P_c\left(T_j\right)}{EER_{bin}\left(T_j\right)} \right)}$$

where:

– h_j is the frequency of occurrence of the outdoor temperature in temperature bin j, in hours;

– $P_c(T_j)$ is the part load for cooling;

– EERbin(Tj) is the bin-specific energy-efficiency ratio, calculated in accordance with point (g).

(f) The part load for cooling $P_c(T_j)$ shall be calculated as follows:

$$P_c\left(T_j\right) = P_{design,c} \times plc(T_j)$$

where:

– $P_{design,c}$ is the design cooling load;

– $plc(T_j)$ is the part-load ratio.

(g) Declared values for $EER_d(T_j)$ and $P_{dc}(T_j)$ are the measured values at the part-load test conditions for outdoor temperatures T_j ('bins') A to D and $P_{design,c}$, as indicated in Table 9 and Table 10. The values for $EER_{bin}(T_j)$ shall be determined through interpolation and extrapolation of known values. If the space-heater cooling capacity in a bin is too high for the cooling demand in the bin by more than 10 %, the space-heater will cycle on/off and a degradation factor (C_{dc}) and a capacity ratio (CR) has to be used to calculate the EER_{bin} for T_j in the following way:

$$EER_{bin} = \frac{EER_d \times CR}{C_{dc} \times CR + (1 - C_{dc})}$$

where:

– EER_d is the declared energy-efficiency ratio, for the conditions of Table 9 and Table 10;

– CR is the capacity ratio, calculated in accordance with point (h);

– C_{dc} is the degradation coefficient for cycling behaviour; it is either 0.9 by default or it can be determined by a series of cyclic tests; it is then calculated as the ratio between

the power during the on phase and the power during the off phase divided by the power during the on phase.

For cycling, the water-temperature regime in the on phase is modified to maintain the same time-average water-temperature regime over the whole on/off cycle as in the stationary condition without cycling.

(h) The capacity ratio CR for the purposes of point (g) is calculated in the following way:

$$CR = plc(T_j) \times \frac{P_{designc}}{P_{dc}}$$

where:

– $plc(T_j)$ is the cooling part-load ratio;

– $P_{designc}$ is the design cooling load;

– P_{dc} is the minimum capacity for cooling in continuous operation.

6.2. Seasonal space-cooling energy efficiency of reversible fuel heat-pump heaters and hybrid heat-pump heaters with fuel heat-pump heat generators,

(a) The seasonal space-cooling energy efficiency $\eta_{s,c}$ shall be calculated in the following way:

$$\eta_{s,c} = SPERc \times (1 - \sum F(i))$$

where:

– $SPER_C$ is the seasonal primary energy ratio in cooling mode, calculated in accordance with point (b);

– $\Sigma F(i)$ is the sum of the values of F(1) and F(2), where:

  – F (1) is the control correction factor, calculated in accordance with Section 5.1.;

  – F(2) is the auxiliary electricity correction factor, calculated in accordance with Section 5.2. point (d).

(b) The seasonal primary energy ratio in cooling mode $SPER_C$ shall be calculated as follows:

$$SPER_c = \frac{1}{\frac{1}{SFUEc} + \frac{CC}{SAEFc}}$$

where:

– SFUEc is the seasonal fuel-utilization efficiency in cooling mode, calculated in accordance with point (c);

– SAEFc is the seasonal auxiliary energy factor in cooling mode, calculated in accordance with point (d);

– CC is the conversion coefficient.

(c) The seasonal fuel-utilization efficiency in cooling mode $SFUE_C$ shall be calculated as follows:

$$SFUE_c = \frac{\sum_{j=1}^{n} h_j \times P_c(T_j)}{\sum_{j=1}^{n} h_j \times \frac{P_c(T_j)}{FUE_c(T_j)}}$$

where:

– h_j is the frequency of occurrence of the outdoor temperature in temperature bin j, in hours;

– $P_c(T_j)$ is the part-load for cooling;

– $FUE_c(T_j)$ is the bin-specific fuel-utilization efficiency for cooling at partial load.

(d) The seasonal auxiliary energy factor in cooling mode (SAEFc) shall be calculated in the following way:

$$SAEFc = \frac{Q_C}{Q_{CE}}$$

where:

– Q_C is the reference annual cooling demand, calculated in accordance with point (e);

– Q_{CE} is the annual energy consumption for cooling, calculated in accordance with point (f).

(e) The reference annual cooling demand (Q_C) shall be calculated in the following way:

$$Q_C = P_{design,c} \times H_{CE}$$

where:

– $P_{design,c}$ is the design cooling load;

– H_{CE} are the equivalent active mode hours for cooling as set out in Table 2;

(f) The annual energy consumption for cooling (Q_{CE}) shall be calculated in the following way:

$$Q_{CE} = \frac{Q_C}{SAEFc_{on}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{OFF} \times P_{OFF} + H_{CK} \times P_{CK}$$

where:

– Qc is the reference annual cooling demand,

– $SAEF_{c,on}$ is the seasonal auxiliary energy factor in cooling mode in active mode, calculated in accordance with point (g);

– H_{TO} are the annual hours in thermostat-off mode, indicated in Table 2;

– H_{SB} are the annual hours in standby mode, indicated in Table 2;

– H_{CK} are the annual hours in crankcase mode, indicated in Table 2;

– H_{OFF} are the annual hours in off mode, indicated in Table 2;

– P_{TO} is the measured power in thermostat-off mode;

– P_{SB} is the measured power in standby mode;

– P_{CK} is the measured power in crankcase mode;

– P_{OFF} is the measured power in off mode.

(g) The seasonal auxiliary energy factor in cooling mode in active mode shall be calculated in the following way:

$$SAEF_{c,on} = \frac{\sum_{j=1}^{n} h_j \times P_c(T_j)}{\sum_{j=1}^{n} h_j \times \frac{P_c(T_j)}{AEF_c(T_j)}}$$

where:

– h_j is the frequency of occurrence of the outdoor temperature in temperature bin j, in hours;

– $P_c(T_j)$ is the part load for cooling;

– $AEF_c(T_j)$ is the auxiliary energy factor in cooling mode at partial load.

(h) The conditions for calculating the $SGUE_c$ and the $SAEF_{c,on}$ shall consider:

(1) the reference design conditions set out in Table 11;

(2) the European average cooling season set out in Table 11;

(3) if applicable, the effects of the degradation of energy efficiency caused by cycling depending on the type of control of the cooling capacity.

Table 8

Standard rating conditions for cooling

		Outdoor-side heat exchanger		Indoor-side heat exchanger	
		inlet temperature ºC	outlet temperature ºC	inlet temperature ºC	outlet temperature ºC
Cooling mode	Air-to-water (low cooling temperature applications)	35	N/A	12	7
	Air-to-water (for medium cooling temperature applications)	35	N/A	23	18
	Exhaust air-to-water (for low cooling temperature applications)	27	N/A	12	7
	Exhaust air-to-water (for medium cooling temperature applications)	27	N/A	23	18
	Water-to-water (for low cooling temperature applications) from cooling tower	30	35	12	7
	Water-to-water (for medium cooling	30	35	23	18

	temperature applications) from cooling tower				
	Water/brine-to-water (for low cooling temperature applications) from ground heat exchanger	10	15	12	7
	Water/brine-to-water (for medium cooling temperature applications) from ground heat exchanger	10	15	23	18
	DX Bath temperature (for low cooling temperature applications)	30	N/A	12	7
	DX Bath temperature (for medium cooling temperature applications)	30	N/A	23	18

Table 9

Part-load test conditions for cooling: air-to-water units

	Part-load ratio	**Part-load ratio**	**Outdoor heat exchanger**		**Indoor heat exchanger**		
			Outdoor air dry bulb temperature	**Exhaust air dry bulb temperature**	**Low-temperature application Inlet/outlet water(brine) temperatures**		**Medium-temperature application Inlet/outlet water(brine) temperatures**
					Fixed outlet	**Variable outlet[b]**	
		%	°C	°C	°C	°C	°C
A	(35–16)/($T_{designc}$ – 16)	100.00	35	27	12 / 7	12 / 7	23 / 18
B	(30–16)/($T_{designc}$ – 16)	73.68	30	27	[a] / 7	[a] / 8.5	[a] / 18
C	(25–16)/($T_{designc}$ – 16)	47.37	25	27	[a] / 7	[a] / 10	[a] / 18

D	(20–16)/($T_{designc}$ – 16)	21.05	20	27	[a] / 7	[a] / 11.5	[a] / 18

[a] With the flow rate as determined during 'A' test for units with a fixed flow rate or with a fixed water temperature difference of 5 K for units with a variable flow rate. If, for any of the test conditions the resulting flow rate is below the minimum flow rate, then this minimum flow rate is used as a fixed flow rate with the outlet temperature for this test condition.

[b] If the variable outlet temperature is above the maximum of the operating range of the unit, this maximum is used.

Table 10

Part-load test conditions for cooling: ground / cooling tower-to-water units

Part-load ratio	**Part-load ratio**	**Outdoor heat exchanger**			**Indoor heat exchanger**		
		Cooling tower or water (brine) loop	**Ground coupled application**	**DX**	**Low-temperature heating application**		**Medium-temperature heating application**
		Inlet/outlet water(brine) temperatures	**Inlet/outlet water (brine) temperatures**	**Bath tempe-rature**	**Inlet/outlet water(brine) temperatures**		**Inlet/outlet water (brine) temperatures**
					Fixed outlet	**Variable outlet[c]**	
	%	°C	°C	°C	°C	°C	°C
(35–16)/($T_{designc}$ – 16)	100	30 / 35	10 / 15	30	12 / 7	12 / 7	23 / 18
(30–16)/($T_{designc}$ – 16)	73.68	26 / [b]	10 / [b]	30	[a] / 7	[a] / 8.5	[a] / 18
(25–16)/($T_{designc}$ – 16)	47.37	22 / [b]	10 / [b]	30	[a] / 7	[a] / 10	[a] / 18
(20–16)/($T_{designc}$ – 16)	21.05	18 / [b]	10 / [b]	30	[a] / 7	[a] / 11.5	[a] / 18

[a] With the flow rate as determined during 'A' test for units with a fixed flow rate or with a fixed water temperature difference of 5 K for units with a variable flow rate. If, for any of the test conditions the resulting flow rate is below the minimum flow rate, then this minimum flow rate is used as a fixed flow rate with the outlet temperature for this test condition.

[b] With the flow rate as determined during 'A' test for units with a fixed flow rate or with a fixed water temperature difference of 5 K for units with a variable flow rate. If, for any of the test conditions the resulting flow rate is below the minimum flow rate, then this minimum flow rate is used as a fixed flow rate with the inlet temperature for this test condition.

[c] If the variable outlet temperature is above the maximum of the operating range of the unit, this maximum is used.

Table 11

European cooling season

Bins	Outdoor temperature (dry bulb)	'Average cooling season'
		bin hours
j	T_j	h_j
#	°C	h/annum
1	17	205
2	18	227
3	19	225
4	20	225
5	21	216
6	22	215
7	23	218
8	24	197
9	25	178
10	26	158
11	27	137
12	28	109
13	29	88
14	30	63
15	31	39
16	32	31
17	33	24
18	34	17
19	35	13
20	36	9
21	37	4
22	38	3
23	39	1
24	40	0

7. SOUND POWER

7.1. Heat-pump heaters and hybrid heat pump heaters in heating mode

The sound-power level of heat-pump heaters shall be assessed using the same settings for parameters that affect the sound-power level, such as compressor speed and stages, fan speed, etc., as used for determining the heat output for space-heating at part-load conditions C (settings 1) or B (settings 2) for average climate and medium-temperature heating applications in heating mode (or low-temperature application for low-temperature heat pump heater), as specified in Table 13.

Table 13

Heating mode sound-power test conditions for heat-pump heaters and hybrid heat-pump heaters

Heat-pump heat source	**Outdoor heat exchanger – inlet dry (wet) bulb temperature in °C**	**Settings that affect sound power, such as compressor and fan speed or stage *****	
		Settings 1	**Settings 2**
air-to-water	7 (6) **	Part-load condition C	Part-load condition B
exhaust air-to-water	20 (15)	Part-load condition C	Part-load condition B
Ground heat exchanger	5 /*	Part-load condition C	Part-load condition B
Ground direct exchange	4	Part-load condition C	Part-load condition B

* With the fixed or variable water flowrate of Table 10, calculated in agreement with standard rating conditions of Table 3.

** A lower temperature down to 2 °C can be chosen if the unit can stabilise operations without defrost in the chosen conditions.

*** In case the energy efficiency at part-load condition results from the interpolation amongst different capacity stages, the sound power should be measured based on the higher of the two capacity stages.

7.2. Heaters other than heat-pump heaters and hybrid heat-pump heaters and cooling mode

For all heaters that are not heat-pump heaters or hybrid heat-pump heaters, the sound power tests are to be conducted at standard-rated heat output.

For reversible heat-pump heaters or reversible hybrid heat-pump heaters in cooling mode, the sound power tests are to be conducted at standard-rated cooling output.

8. SOLAR DEVICES

8.1. Solar device testing

(a) The solar collector(s) and, if applicable, the solar hot water storage tank(s) of the solar device, shall be tested separately, except for a solar device, for which the solar collector(s) and hot-water storage tank(s) form an inseparable unit or need to be tested together in order to determine the solar-device efficiency, and which is placed on the market as a single unit.

(b) The standards as referenced in Annex VIII shall be applied.

(c) The weather data to be used for determining GTY shall relate to the location of:

(i) Helsinki or Stockholm for the colder climate;

(ii) Strasbourg or Würzburg for the average climate; and

(iii) Athens for the warmer climate.

(d) The orientation for non-tracking collectors shall be south for all locations.

(e) The inclination for non-tracking collectors shall be:

(i) 45 º for the colder climate;

(ii) 35 º for the average climate; and

(iii) 25 º for the warmer climate.

(f) For collectors designed to track the path of the sun, the optimal tracking parameters declared by the manufacturer for the locations indicated in point (c) shall be used.

(g) When performing tests of solar collectors and/or subsequent calculations, the volume of the solar storage tank shall not be less than 0.06 litre of water per kWh of GTY of the collector array.

8.2. Solar device efficiency for water heating

(a) The solar device efficiency for water heating $\eta_{sol,wh}$ shall be calculated per climate condition and load profile as:

$$\eta_{sol,wh} = f_{\text{sol},wh,lp} \times f_{\text{tank}}$$

where:

– f_{tank} is the tank factor, as set out in Table 13, specified for the energy-efficiency class of the storage tank as indicated in the product-information sheet of the storage tank;

– $f_{\text{sol,wh,lp}}$ is the solar-device factor, calculated in accordance with point (b).

(b) The solar device factor $f_{\text{sol,wh,lp}}$ shall be calculated per climate condition and load profile in the following way:

$$f_{sol,wh,lp} = \left(a \times \left(\frac{GTY}{Q_{wh,sol}} \right)^2 + \left(b + d \times f_{profile} \right) \times \frac{GTY}{Q_{wh,sol}} + c \right)$$

where:

– *GTY* is the climate-specific gross thermal yield per year (kWh/yr) of the solar device, calculated in accordance with point (c);

– $Q_{wh,sol}$ means the annual solar water heating demand, for the applicable load profile, calculated in accordance with point (d);

– coefficient *a, b, c* and *d* are the solar device water heating efficiency coefficients per climate condition, set out in Table 14;

– $f_{profile}$ is tapping load profile specific coefficient as set out in Table 15.

The solar-device efficiency for water heating η_{wh} as calculated for the combinations of *GTY* and Q_{ref} shall not be less than 100 % and not more than the upper limits 240 %, 450 % and 500 % for the colder, average and warmer climate respectively.

Table 13

Tank factor

Storage-tank energy-label class	**A**	**B**	**C**	**D**
Storage-tank correction factor f_{tank}	1.20	1.15	1.1	1.05

Table 14

Coefficients for calculation of $\eta_{sol,wh}$

Solar-device water-heating efficiency coefficients per climate	a	b	c	d
Average	-0.22	1.93	0.55	0.36
Colder	-0.52	1.94	0.60	0.28
Warmer	1.17	0.59	0.83	0.50

Table 15

Load profile specific coefficient for calculation of $\eta_{sol,wh}$

Load profile	M	L	XL	XXL	3XL	4XL
$f_{profile}$ (-)	0	0.92	1.38	1.64	2.43	3.56

(c) The GTY of a solar device shall be calculated in the following way:

(i) if the solar collector(s) of the solar device were tested separately from the hot water storage tank of the solar device, the GTY shall be calculated using the calculation method referred to in Annex VIII;

(ii) if the solar collector(s) and the hot water storage tank of the solar device were tested together;

(iii) the GTY shall be equal to the amount of solar heat delivered ($Q_{sol,}$), determined for the smallest load profile, for which the non-solar heat required (Q_{nonsol}) for the 'warmer' climate conditions is equal to or higher than the minimum values shown in Table 16.

Table 16

The minimum value for Q_{nonsol}

	M	L	XL	XXL	3XL	4XL
Limit value (kWh/a)	520	950	1510	1910	3570	7060

(d) The non-solar heat required (Q_{nonsol}), expressed in kWh/a, shall be calculated in the following way:

$$Q_{nonsol} = Q_{wh,sol} - Q_{sol}$$

where:

– $Q_{wh,sol}$ is the annual solar water heating demand, calculated in accordance with point (3), and expressed in kWh/a;

– Q_{sol} is the solar heat delivered, determined using standards referred to in Annex VIII, and expressed in kWh/a;

(e) The annual solar-water-heating demand ($Q_{wh,sol}$) shall be calculated in the following way:

$$Q_{wh,sol} = 0.6 * 366 * \left(Q_{ref} + 1.09\right)$$

8.3 Solar-device efficiency for space heating

The solar-device efficiency for space heating $\eta_{sol,sh}$ shall be calculated per climate condition and load profile in the following way:

$$\eta_{sol,sh} = f_{sol,sh} \times f_{tank}$$

where:

– $f_{sol,sh}$ is the solar device factor for space heating, calculated in accordance with letter (b),

– f_{tank} is the tank factor, as set out in Table 13, specified for the energy-efficiency class of the storage tank as indicated in the product information sheet of the storage tank based on the Regulation [EL for water heaters and storage tanks].

The solar device factor for space heating shall be calculated in the following way:

$$f_{sol,sh} = a * \left(\frac{GTY}{Q_H}\right)^2 + b * \left(\frac{GTY}{Q_H}\right) + c$$

where:

– *GTY* is the gross thermal yield per year (kWh/a) of the solar device for climate conditions, calculated in accordance with point (c), Section 7.2.;

– Q_H is the annual space-heating demand (kWh/a), calculated in accordance with point (c);

– *a*, *b,* and *c* are the coefficients set out in Table 17.

The calculated solar device efficiency for the combinations of GTY and Q_H shall be not less than 100% and not more than 300%.

Table 17

Coefficients for calculation of $\eta_{sol,sh}$

	Solar-device space-heating efficiency coefficients		
Climate conditions	**A**	**b**	**c**
Average	0.00	0.50	1.00
Colder	0.00	0.61	1.00
Warmer	0.17	0.23	1.00

Q_H shall be calculated in the following way:

– For heat pump and hybrid heat pump heaters: $Q_H = P_{design,h} \times H_{HE}$

– For other heat generators: $Q_H = P_4 \times H_{HE}$

– where H_{HE} value given in Table 2 for the various climates.

9. TEMPERATURE CONTROLS

The contribution factor of temperature controls to the seasonal space-heating energy efficiency of packages ('TC', expressed in percentage points) is set out in Table 18.

Table 18

Contribution factor of temperature controls to η_{sh} for packages (TC)

Control class	TC (percentage points)
I	1
II	2
III	1.5
IV	2
V	2.5
VI	3.5
VII	2.5
VIII	5

Where:

– Control class I – Room Thermostat, on/off: A room thermostat that controls the on/off operation of a heater. Performance parameters, including switching differential and room-temperature-control accuracy are determined by the thermostat's mechanical construction.

– Control class II – Weather compensator control, modulating: A heater flow temperature control that varies the set point of the flow temperature of water leaving the heater dependent upon the prevailing outside temperatures and a selected weather compensation curve. Control is achieved by modulating the output of the heater.

– Control class III – Weather compensator control, on/off: A heater flow temperature control that varies the set point of the flow temperature of water leaving the heater dependent upon the prevailing outside temperature and a selected weather compensation curve. Heater flow temperature is varied by controlling the on/off operation of the heater.

– Control class IV – A generic load-compensating control, proportional on/off, time-proportional-integral (TPI) controls and other similar control devices that use different algorithms, TPI and similar control strategies that reduce mean water temperature, improve room-temperature-control accuracy and improve system efficiency.

– Control class V – Modulating room thermostat, modulating: An electronic room thermostat that varies the flow temperature of the water leaving the heater dependent upon the deviation of the measured room temperature from room thermostat set point. Control is achieved by modulating the output of the heater.

– Control class VI – Weather compensator and room sensor, modulating: A heater flow temperature control that varies the flow temperature of water leaving the heater

dependent upon the prevailing outside temperature and a selected weather compensation curve. A room-temperature sensor monitors room temperature and adjusts the compensation curve parallel displacement to improve room comfort. Control is achieved by modulating the output of the heater.

– Control class VII – Weather compensator and room sensor, on/off: A heater flow temperature control that varies the flow temperature of water leaving the heater dependent upon the prevailing outside temperature and a selected weather compensation curve. A room-temperature sensor monitors room temperature and adjusts the compensation curve parallel displacement to improve room comfort. Heater flow temperature is varied by controlling the on/off operation of the heater.

– Control class VIII – Multi-sensor room temperature control, modulating or proportional on/off: An electronic control, equipped with three or more room sensors that varies the flow temperature of the water leaving the heater dependent upon the deviation of the aggregated measured room temperature from room sensor set points. Control is achieved by modulating or using a proportional on/off strategy to regulate the output of the heater.

10. SEASONAL SPACE-HEATING EFFICIENCY OF PACKAGES

(a) The seasonal space-heating efficiency of a package $\eta_{s,pack}$ shall be calculated in the following way:

$$\eta_{s,pack} = \eta_{sol,sh} \times \eta_{sh} \times f_{tank} \times (1 - F(1) + \mathrm{TC})$$

where:

– $\eta_{sol,sh}$ is the solar-device space-heating efficiency of the solar device included in the package, in %, indicated in the product-information sheet for this solar device;

– η_{sh} is the space-heating efficiency of the heater included in the package, indicated in the product information sheet for this heater;

– F(1) is the control correction, calculated in accordance with Section 5 of this Annex;

– TC is the temperature control value, as set out in Table 18, Section 10;

– f_{tank} is the tank factor, as set out in Table 13, Section 10.2, specified for the energy-efficiency class of the storage tank, indicated in the product information sheet of this storage tank based on the Regulation [EL for water heaters and storage tanks].

(b) If the package for which the seasonal space-heating efficiency is calculated in accordance with point (a) does not include:

(i) a solar device - $\eta_{sol,sh}$ is equal to 1;

(ii) a tank - f_{tank} is equal to 1;

(iii) a temperature control of classes I-VIII as described in Section 10 – TC is equal to 1.

11. WATER HEATING EFFICIENCY OF A PACKAGE

The water-heating efficiency of a package is calculated per climate condition and load profile in the following way:

$$\eta_{wh,pack} = \eta_{sol,wh,lp} * \eta_{wh,lp} * f_{SWHRD,lp}$$

where:

– $\eta_{sol,wh,lp}$ is the solar-device efficiency for water heating of the solar device included in the package, in %, indicated in the product information sheet for the solar device included in the package;

– $\eta_{wh,lp}$ is the water-heating energy efficiency of the combination heater included in the package, indicated in the product-information sheet for this combination heater;

– $f_{SWHRD,lp}$ is the shower-water heat-recovery device factor of the shower-water heat-recovery device included in the package, indicated in the product-information sheet for this shower-water heat-recovery device.

12. SHOWER WATER HEAT RECOVERY DEVICE

12.1. Testing of the shower-water heat-recovery device

(a) The shower water flow rate and the incoming cold water flow rate shall be matched.

(b) The shower water flow rate shall have a temperature between 35 and 40 °C and the incoming cold water a temperature of 10 °C.

(c) The combined volume of flow rates for the highest flow rates at which the shower water heat recovery devices supplied in the package have been tested exceeds the load profile flow rate for the water heater package as indicated in Table 7.

12.2. Shower-water heat-recovery device factor

(a) The shower water heat recovery device factor $f_{SWHRD,lp}$ is calculated, in % as:

$$f_{SWHRD,lp} = \frac{100}{\left(100 - \left(\eta_{SWHRD,lp} * 0.64\right)\right)}$$

Where $\eta_{SWHRD,lp}$ is the shower water heat recovery device efficiency for the declared load profile of the combination heater included in the package, calculated as set out in point (b) or (c) accordingly. If the package includes more than one shower-water heat-recovery device, the shower-water heat-recovery device efficiency is calculated in accordance with point (d).

(b) The shower-water heat-recovery device efficiency for a load profile $\eta_{SWHRD,lp}$, established at one flow rate, is calculated in the following way:

(i) If the shower-water heat-recovery device efficiency η_i has been established at a flow rate q_i equal to the load profile flow rate $q_{V,lp}$, the $\eta_{SWHRD,lp}$ for the declared load profile is the η_i.

(ii) If the shower-water heat-recovery device efficiency has been established at a flow rate of 12.5 l/min ($\eta_{12.5}$) and the applicable load profile flow rate $q_{V,lp}$ is lower, the $\eta_{SWHRD,lp}$ for the declared load profile is calculated as:

$$\eta_{SWHRD,lp} = \eta_{12.5} + \left(0.8 * 0.01 * (12.5 - q_{V,lp})\right)$$

(c) The shower water heat recovery device efficiency for a load profile $\eta_{SWHRD,lp}$, established at two flow rates, one of which is 12.5 l/min ($\eta_{12.5}$) and the other is lower (η_i), and the applicable load profile flow rate $q_{V,lp}$ is below 12.5 l/min, is calculated in the following way:

$$\eta_{SWHRD,lp} = \eta_{12.5} + \left(0.8 * \frac{\eta_{12.5} - \eta_i}{q_{V,12.5} - q_{V,i}} * (q_{V,lp} - 12.5)\right)$$

where:

– $\eta_{12.5}$ is the shower water heat recovery device efficiency established in a test at a flow rate of 12.5 l/min;

– η_i is the efficiency of the shower-water heat-recovery device efficiency established in a test at a flow rate other than 12.5 l/min;

– $q_{12.5}$ is the water flow rate of 12.5 l/min used in the test;

– $q_{V,i}$ is the water flow rate other than 12.5 l/min used in the test;

– $q_{V,lp}$ is the applicable load profile flow rate indicated in Table 19.

(d) The $\eta_{SWHRD,lp}$ for a package including multiple shower water heat recovery devices shall be calculated as the flow rate weighted average of the efficiencies established for the individual shower water heat recovery devices.

Table 19

Flow rate $q_{V,lp}$ per load profile

Load profile	**XS**	**S**	**M**	**L**	**XL**	**XXL**	**3XL**	**4XL**
$q_{V,lp}$ (l/min)	3	5	6	8	8	12	48	96

ANNEX VIII

Transitional methods

References and qualifying notes for space heaters and combination heaters

(The source of all references is CEN unless otherwise indicated)

Parameter	Reference/ Title	Notes and short description

1. FUEL BOILER HEATERS USING GASEOUS FUELS

η, P, design types, P_{stby} ($P_{h,l}$), Sound power indoor, outdoor	***EN 15502-1:2021+A1:2023 Gas-fired heating boilers – Part 1: General requirements and tests;***	
Useful nominal heat output P_N (= P_4) and useful efficiency η_u (=η_4) at standard-rated heat output	§ 3.1.6.1 Nominal output (definition); § 3.1.5.7 Useful efficiency (definition, symbol); § 9.2.2 (test);	Useful output P_N at 80 °C/60 °C stated by the manufacturer in kW. Useful efficiency η_u is the ratio of the useful output to the heat input in GCV, expressed as a percentage. At the nominal boiler heat input (or minmax average for range-rated boilers) the water flow rate through the boiler is adjusted to obtain a return water temperature of (60 ± 1) °C and a temperature difference between flow and return water temperature of (20 ± 2) °C.
Design types, definitions	§ 3.1.10. Design types of boilers with definitions of 'combination-boiler'; 'low-temperature boiler' and 'condensing boiler'.	
Nominal condensing heat output at 30 % P_N (= P_1) and useful efficiency η_1 at 30 % part-load and 30/50 temperature regime	§ 3.1.6.2. Nominal condensing heat output at 50 °C/30 °C water temperature regime § 9.3.2. Useful efficiency at part-load, Tests; § 9.5.2.1. Conversion from NCV to GCV	tests are carried out at 30 % of nominal heat input, at test return temperatures 30± 0.5 °C (condensing boiler), 37± 1 °C (low-temperature boiler) or 47 ± 1 °C (standard boiler) or 50 ± 1 °C (other boiler). *Feed temperature of 50 °C for condensing boiler heaters is to be applied*
Standby heat loss P_{stby} ($P_{h,l}$)	§ 9.3.2.3.1.3 Standby losses (test);	In a circuit with (spent) boiler and pump, an auxiliary electric boiler keeps the water at a temperature

		(30±5) K above ambient. The electricity use of the auxiliary boiler, corrected for inherent losses of the test circuit and thermal contribution of the pump is P_{stby} ($P_{h,l}$).
Seasonal space-heating energy efficiency in active mode η_{son} and overall η_s	§ 9.4.6. η_{son} definition $\eta_{son} = 0.85\times \eta_1 + 0.15\times \eta_4$ also defines correction factors F(1), F(2), F(3)	η_s formula needs to be adapted as follows: $\eta_{s,h} = \eta_{son} \times \left(1 - \frac{\sum F(i)}{100\%}\right)$
Emission of nitrogen oxides NO_x	§ 8.13. NO_X (classification, test- and calculation methods)	NO_X emission values are to be expressed in gross calorific value GCV. §8.13.2.1 already distinguishes correction factors to the ecodesign limits for G30 and G31 test gases, which is now part of the Annex II of this regulation .
Remote control	§ 5.7.9 Instructions for safe remote control operations	On data exchange, see clause 7.8 of EN 13611:2019
Sound-power level indoors L_{WA}	***EN 15036 - 1:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	
Sound-power level outdoors L_{WA}	***EN 15036 - 2:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	

2. FUEL BOILER HEATERS USING LIQUID FUELS

General test conditions	***EN 304:2017; Heating boilers - Test code for heating boilers for atomising oil burners; Section 6 ('Tests')***	***Notes***
Useful nominal heat output P_N (= P_4) and useful efficiency η_u (=η_4) at standard-rated heat output	§ 6.2. P_N (= P_4) definition § 6.3. η_u (=η_4) definition annex A.10. Conversion NCV to GCV	as gas-fired boilers
Nominal condensing heat output at 30% P_N (= P_1) and useful efficiency η_1 at 30% part load and 30/50 temperature regime	§ 6.8. η_1 at 30 % part load § 6.5.4.1. direct method *(to be used)*	as gas-fired boilers

Standby heat loss P_{stby} $(P_{h.l})$	§ 6.7.3 Standby heat loss method 2	Method 2 is identical to the test and calculation method for gas boilers.
Seasonal space-heating energy efficiency in active mode η_{son} with test results for useful output P	§ 6.10. η_{son} definition annex A.10 $\eta_{son} = 0.85\times \eta_1 + 0.15\times \eta_4$ also defines correction factors F(1), F(2) and F(3)	η_s formula needs to be adapted as follows: $$\eta_{s,h} = \eta_{son} \times \left(1 - \frac{\sum F(i)}{100\%}\right)$$ (F(4) coefficient to be removed in standard) For B1 boiler testing see also EN 303-1:2017. Part 1: Heating boilers with forced draught burners --Terminology EN 303-2:2017. Part 2: Special requirements atomizing burners EN 303-4:2017. Part 4: Special requirements forced draught burners up to 70 kW
Emission of nitrogen oxides NO_X	***EN 267:2020*** ***Automatic forced draught burners for liquid fuels;*** § 5. Testing. ANNEX B. Emission measurements and corrections. ***EN 304:2017*** Weighting of emissions at standard-rated conditions and at 30 % load ^6.17.2	
Sound-power level indoors L_{WA}	***EN 15036 - 1:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	
Sound-power level outdoors L_{WA}	***EN 15036 - 2:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	

3. ELECTRIC BOILER SPACE-HEATERS AND ELECTRIC BOILER COMBINATION HEATERS

Seasonal space-heating energy efficiency ηs of electric boiler space-heaters and electric	European Commission: See Annex III	

boiler combination heaters		

4. COGENERATION SPACE-HEATERS AND COGENERATION HEATER WITH BACKUP BOILER

General test conditions	***EN 50465:2015/A1:2019. Gas appliances – Combined heat and power appliance of nominal heat input inferior or equal to 70 kW***	***Notes***
Nominal heat output P_N (= P_4) and useful efficiency η_u (=η_4) at standard-rated heat output	§ 3.7.4.3 Nominal heat output (in kW) § 6.6.1 Efficiency (definitions) § 7.6.1 Efficiency (test)	P_N (= P_4) corresponds to $P_{th\ n}$; Different from § 7.6.1 the standard-rated heat output test is always to be done at 80/60 °C and always at declared (maximum) heat output. Efficiency is always with heat input in GCV.
Nominal electric power output P_{el}	§ 3.7.4.5. net AC electric power output (in kW)	
Overall efficiency	§ 3.7.5 ratio of the useful heat output and the net AC electric power output to the heat input (in %)	Note that in the Regulation the electric power output is multiplied by a factor 2.65 to indicate the energy savings. Useful heat output has the same meaning of the heat output mentioned in the Regulation.
Standby heat loss P_{stby} ($P_{h,l}$) and auxiliary electricity	§ 7.6.2, § 6.6.4, § 6.6.3	
Emission of nitrogen oxides NO_X	§7.8.2 NOX (Other pollutants)	NO_X emission values are expressed in gross calorific value GCV.
Sound-power level indoors L_{WA}	§7.17 refers to ***EN 15036 - 1:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	
Sound-power level outdoors L_{WA}	***EN 15036 - 2:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	Not considered in EN50465:2015/A1:2019
Seasonal space-heating energy efficiency η_s of boiler space-heaters, boiler combination heaters and cogeneration space-heaters		Additional elements for measurements and calculations related to the seasonal space-heating energy efficiency of boiler space-heaters, boiler combination heaters and cogeneration space-heaters.

5. ELECTRIC HEAT-PUMP SPACE-HEATERS AND HYBRID HEAT-PUMP SPACE-HEATERS

General test conditions	***EN 14511-2: 2022*** ***Air conditioners, liquid chilling packages and heat-pumps for space-heating and cooling and process chillers, with electrically driven compressors - Part 2: Test conditions***	***Notes***
Standard rating conditions	Heating: Water & Brine. Tables 7 (LT), 9 (MT) & 10 (HT) and Outdoor air & Exhaust air, Tables 12 (LT), 14 (MT) and 15 (HT) Cooling: Water & Brine. Tables 11 and 16	
	EN 14825-2022 ***Air conditioners, liquid chilling packages and heat-pumps, with electrically driven compressors, for space-heating and cooling, heat-pumps, with electrically driven compressors, for space-heating – Testing and rating at part-load conditions and calculation of seasonal performance***	
Reference design conditions for heating $P_{designh}$, T_{biv}, TOL	§6.1. reference conditions for space-heating. $P_{designh}$= +2, -10, -22 °C; Tbiv= +7, +2, -7 °C; TOL= +2, -7, -15 °C for climates Warmer, Average, Colder	
Part-load test conditions for heating	§ 6.4 Air-to-water(brine) units Tables 8, 10 and 11 §6.5 DX-to-water(brine) and water(brine)-to-water(brine) units. Tables 12, 14 and 15. The tables give test conditions A to G relating to source (bin) temperatures and – variable or fixed – sink temperature regimes.	All heating seasons (A, W,C) and temperature regimes are covered. Note that for brine ground heat exchanger heat-pumps the new regulation uses higher source temperatures (5/2 instead of 0/-3 °C) The wet-bulb temperature conditions for exhaust air in the standard have to be changed from

		20(12) to 20(15). The mean logarithmic temperature difference should be introduced to enable the possible deployment of CO2 as a refrigerant.
Seasonal space-heating energy efficiency $\eta_{s,h}$ and initial determination of seasonal coefficient of performance *SCOP*	§7.2. $\eta_{s,h}=(1/CC)\times SCOP_{on}\ \Sigma F(i)$ §7.3. $SCOP= Q_H/Q_{HE}$ where Q_H is annual heat demand and Q_{HE} is annual heating energy. §7.4. $Q_H = P_{designh} \times H_{HE}$ where $P_{designh}$ is design heat load in kW and H_{HE} is the equivalent active mode hours. §7.5. With hours (and measured power) for auxiliary and off modes the formula for $SCOP_{on}$ is complete	$\eta_{s,h}$ to be updated as follows: $\eta_{s,h}=(1/CC)\times SCOP_{on}$ x $(1 \square \Sigma F(i))$ The equivalent active mode hours H_{HE} are given in Annex B. The hours for off-mode H_{OFF}, thermostat-off mode H_{TO}, standby mode H_{SB} and crankcase heater mode H_{CK} are given in Annex B2. and B3.
Seasonal coefficient of performance in active mode $SCOP_{on}$	§7.6 and §7.7. $SCOP_{on}$ is derived from capacity *P* and *COP* at the standard rating conditions A to F. Missing bin values are determined by interpolation / extrapolation. When *P* is more than heat demand in a bin, the cycling impact is calculated (parameters *CR, Cd*). When P is less than the bin heat demands the electric backup (*elbu*) heat is required. In the end, the COP values per bin are summed, weighted for the bin hours per bin.	Annex B.1.3 Heating: Table A.2 with look-up for bin hours per outdoor temperature, needed for calculating $SCOP_{on}$
Reference design conditions for cooling $T_{designc}$	§4.1. Reference conditions for space heating. $T_{designc}$ = +35 °C, only one relevant climate.	

Part-load test conditions for cooling	§4.4 Air-to-water(brine) units Tables 4. §4.5 DX-to-water(brine) and water(brine)-to-water(brine) units. Table 5. The tables give test conditions A to D relating to source (bin) temperatures and – variable or fixed – sink temperature regimes.	
Seasonal space-cooling energy efficiency $\eta_{s,c}$ and determination of Seasonal energy-efficiency ratio	§5.2. $\eta_{s,c}=(1/CC)\times SEER_{on}\ \Sigma F(i)$ §5.3. $SEER= Q_C/Q_{CE}$ where Q_C is annual cooling demand and Q_{CE} is annual cooling energy. §5.4. $Q_H = P_{designc} \times H_{CE}$ where $P_{designc}$ is design cooling load in kW and H_{CE} is the equivalent active mode hours. §5.5. With hours (and measured power) for auxiliary and off modes the formula for $SEER_{on}$ is complete	$\eta_{s,c}$ to be updated as follows: $\eta_{s,c}=(1/CC)\times SEER_{on}$ x $(1 \square \Sigma F(i))$ The equivalent active mode hours H_{CE} are given in Annex A below 12 kW and in Annex D above 12 kW. The hours for off-mode H_{OFF}, thermostat-off mode H_{TO}, standby mode H_{SB} and crankcase heater mode H_{CK} are given in Annex A2. and A3 below 12 kW and in D2 and D3 above 12 kW.
Seasonal energy-efficiency ratio in active mode $SEER_{on}$	§5.6 and §5.7. $SEER_{on}$ is derived from capacity P and EER at the standard rating conditions A to D. Missing bin values are determined by interpolation/ extrapolation. When cooling output is more than cooling demand in a bin, the cycling impact is calculated (parameters CR, Cd).	Annex A1 below 12 kW and D1 above 12 kW, Tables for bin hours per outdoor temperature, needed for calculating $SEER_{on}$
Separate test method for hybrids, i.e. heat-pumps combined with gas or liquid fuel fired heating boilers.	§8.2 The heat-pump is tested, with fuel boiler attached but not working at standard rating conditions for bin-temperatures higher than $T_{fb,off}$. The fuel boiler is tested according to EN 15502-1 (gas) or EN 304 (liquid fuel). heat output and COP values for missing bins are	$T_{fb,off}$ (fuel boiler off) corresponds to T_{biv}, i.e. the lowest bin temperature where the heat-pump can supply the heat demand on its own. $T_{hp,on}$ (heat-pump on) corresponds to TOL, i.e. the lowest bin temperature where the heat-pump can still have a contribution to supply the heat demand .

	inter/extrapolated, similar as for *elbu.*	The active mode efficiency of the fuel boiler is η_{son_fuelbu} (considered constant independent of load)
Combined test method for hybrids, i.e. heat pumps combined with gas or liquid fuel fired heating boilers	§8.3 The hybrid unit is tested as a 'black box', measuring electricity and fuel at each of the rated test conditions, using the controls of the unit. Installation is according to EN 14511-3, the boiler according to EN 15502-1 (gas) or EN 304 (liquid fuel). Electricity or fuel consumption values for missing bins are interpolated/ extrapolated.	$T_{fb,off}$ (T_{biv}) and $T_{hp,on}$ (TOL) are also rated test conditions.
Cycling parameters Pcyc, Tcyc, Cd, settings for CR	§11.5 and §11.6	
P_{TO}, P_{OFF}, P_{SB}, P_{CK}	§12. Test methods for electric power consumption during off mode, thermostat off mode, standby mode and crankcase heater mode	

6. FUEL HEAT-PUMP HEATERS (ABSORPTION)

General test conditions	***prEN 12309-3:2021*** ***Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70kW – Test methods***	prEN 12309-3:2021 will combine Parts 3, 4 and 5 under development; 2019 version available.
Standard rating conditions	Tables 6 (brine/water), 7 (brine/water, sound power), 8 (air), 10 (air, sound power)	as EN14511-2:2018, but with explicit tables for sound power test
	prEN 12309-6:2021 ***Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70kW – Calculation of seasonal performances***	
Reference design conditions $P_{designh}$, T_{biv}, TOL	§5.1. Table 4 reference conditions for space-heating.	as EN 14825

Part-load test conditions	§5.2.2.1 Air-to-water(brine) units. Tables 5,6,7 (LT). §5.2.2.2 Air-to-water(brine) units. Tables 8,9,10 (MT). §5.2.3.2 water(brine)-to-water(brine) units. Tables 17,18,19 (LT) §5.2.3.3 water(brine)-to-water(brine) units. Tables 20,21,22 (MT)	as EN 14825 gas and electricity consumption per test condition registered and calculated differently but with similar outcome as with electric heat-pump
Seasonal space-heating energy efficiency $\eta_{s,h}$ and initial determination of seasonal primary energy ratio SPER	§5.2. $SPER = 1/\{Prim_{gas}/SFUE + Prim_{elec}/SAEF\}$ *FUE*=Fuel-utilisation efficiency *AEF*= Auxiliary energy factor $Prim_{gas}$ = primary energy gas in GCV (=1); $Prim_{elec} = CC$	In principle similar to EN 14825 but there is the problem of two different types of energy sources.
Seasonal coefficient of performance in active mode $SFUE_{on}$	§5.4 Table 29 is the bin-table to facilitate calculation of *Seasonal FUE* (*SFUE*)	Similar to EN 14825
NOx emissions	EN 14792:2017 Stationary source emissions. Determination of mass concentration of nitrogen oxides. Standard reference method. Chemiluminescence.	This is a standard reference method (SRM) for the determination of nitrogen oxides (NOx) in flue gases emitted to the atmosphere from ducts and stacks. It is a universal method, used amongst others in medium and larger combustion plants.
Hybrid appliances	***EN 12309-7: 2014. Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70 kW - Part 7: Specific provisions for hybrid appliances***	Similar to the methods proposed in EN 14825:2020.
Liquid or gaseous fuel sorption heat pumps Emission of nitrogen oxides NO_X	New European Standard under development within the CEN/TC299 WG2 expert group ***EN 12309-2:2015.*** Section 7.3.13 'NO_X Measurements' (CEN/TC299 WG2)	NO_X emission values must be measured in mg/kWh fuel input and expressed in gross calorific value GCV. No alternative methods to express NO_X in mg/kWh output may be used.

Sound-power level (LWA) of heat-pump space heaters and heat-pump combination heaters	For sound-power level indoor measured and outdoor measured: EN 12102-1:2018 Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space-heating and cooling - Measurement of airborne noise - Determination of the sound-power	To be used also for liquid or gaseous fuel sorption heat pumps

7. FUEL HEAT-PUMP HEATERS (ENGINE)

Standard rating conditions	Tables 6 (brine/water), 7 (brine/water, sound power), 8 (air), 10 (air, sound power)	as EN14511-2:2018, but with explicit tables for sound-power test
	EN 16905-5:2017 ***Gas-fired endothermic engine driven heat pumps___– Calculation of seasonal performances***	
Reference design conditions $P_{designh}$, T_{biv}, *TOL*	§5.1. Table 4 reference conditions for space-heating.	as EN 14825
Part-load test conditions	§5.4.2 Air-to-water(brine) units. Tables 11,12,13 (LT). §5.4.3 Air-to-water(brine) units. Tables 14,15, 16 (MT). §5.5.2 water(brine)-to-water(brine) units. Tables 20,21,22 (LT) §5.5.3 water(brine)-to-water(brine) units. Tables 23,24,25 (MT)	as EN 14825
Seasonal primary energy ratio SPER	§7.1 $SPER=1/\{Prim_{gas}/SFUE+Prim_{elec}/SAEF\}$ *FUE*=Fuel-utilisation efficiency *AEF*= Auxiliary energy factor $Prim_{gas}$ = primary energy gas in GCV (=1); $Prim_{elec}$ =*CC*	as EN 12309-6

Seasonal coefficient of performance in active mode $SFUE_{on}$	§7.4 Table 29 is the bin-table to facilitate calculation of *Seasonal FUE* (*SFUE*)	as EN 12309-6
NOx emissions	EN 14792:2017 Stationary source emissions. Determination of mass concentration of nitrogen oxides. Standard reference method. Chemiluminescence.	This is a standard reference method (SRM) for the determination of nitrogen oxides (NOx) in flue gases emitted to the atmosphere from ducts and stacks. It is a universal method, used amongst others in medium and larger combustion plants. [To check whether specific NOx measurements are in the EN 16905 series]
Sound-power level (LWA) of heat-pump space-heaters and heat-pump combination heaters	For sound-power level indoor measured and outdoor measured: EN 12102-1:2018 Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling - Measurement of airborne noise - Determination of the sound power	To be used also for liquid or gaseous fuel sorption heat-pumps

8. COMBINATION HEATERS

Water-heating energy efficiency and references: $\eta_{wh,}$, Q_{fuel}, Q_{elec}, Q_{cor}, *AFC, AEC, V40*	**prEN 13203-2:2021. Gas-fired domestic appliances producing hot water - Part 2: Assessment of energy consumption.** §7. Ecodesign Related Products Data ($\eta_{wh,}$, Q_{fuel}, Q_{elec}, Q_{cor}, *AFC, AEC, V40*) EN 13203-1:2015. Gas fired domestic appliances producing hot water - Part 1: Assessment of performance of hot water deliveries. *Note: all tests with energy use in summer mode Qgas,p= Qgas,S*
	prEN 13203-4:2021. Gas-fired domestic appliances producing hot water - Part 4: Assessment of energy consumption of **gas combined heat-and-power appliances (mCHP) producing hot water and electricity**. §7. Ecodesign Related Products Data ($\eta_{wh,}$, Q_{fuel}, $E_{eletricity,d}$, Q_{cor}, *AFC, AED*)
	prEN 13203-5:2021. Gas-fired domestic appliances producing hot water - Part 5: Assessment of energy consumption of **gas-fired**

	appliances combined with electrical heat pump. §. TBW
	prEN 13203-6:2021. Gas-fired domestic appliances producing hot water - Part 6: Assessment of energy consumption of **adsorption and absorption heat pumps**. §. TBW
	prEN 13203-7:2021. Gas-fired domestic appliances producing hot water - Part 7: Assessment of energy consumption of combination boilers equipped with **a passive flue heat recovery device**. §. 6.3.2.2.1 Central heating input During the test of the declared water heating load profile according to EN 13302-2:2021, from 06:00 to 21:30h of the profile reference time and when the boiler is not performing its water heating function, the boiler will continuously operate in central heating mode with a feed temperature of 43 °C and a return temperature of 37 °C.
	EN 303-6:2019. Heating boilers - Part 6: Heating boilers with forced draught burners - Specific requirements for the domestic hot water operation and energy performance of water heaters and combination boilers with **atomising oil burners** of nominal heat input not exceeding 70 kW § TBW
	EN 16147:2017/FprA1:2020. **Heat-pumps with electrically driven compressors** - Testing, performance rating and requirements for marking of domestic hot water units. §7. Performance tests. annex A. Load (tapping) profiles
	EN 50440:2015+A1:2020 Efficiency of domestic **electrical storage water heaters** and testing methods
	EN 12897:2016+A1:2020. Water supply. Specification for **indirectly heated unvented (closed) storage water heaters.**

Note that the two latter standards are not strictly for combination heaters (but for dedicated water heaters) but are shown here for lack of a better alternative.

9. SHOWER WATER HEAT RECOVERY DEVICES

Shower water heat recovery device efficiency (%)	NEN 7120:2011/C2:2011 NTA8800:2020, Bijlage U CSTB Protocol RECADO 2015 All three test standards may be accepted as method to determine shower heat recovery device efficiency, as long as the test conditions in ANNEX VII, point 4 are met.

	The efficiency to use in calculations should be determined using shower water flow rates equal or larger than the water flow rates shown in the table (combination of devices to achieve sufficient capacity is allowed)

10. SOLAR DEVICES AND PACKAGES INCLUDING SOLAR DEVICES

Measurement of solar collectors	ISO 9806:2017	Tests produces the input-parameters for the GTY calculation below
Storage tank standing losses (used in tank factor *f*)	FprEN 15332:2019 Clause 5.3 EN 12897:2016+A1:2020 Clause 6.2.2 Annex B EN 12977-3:2018 Annex F.2	When determining standing losses using EN 12897 all relevant volumes, for both/either primary side and domestic side should be filled and heated to required storage temperatures, in a similar way to how the tank would be used in real-life. See EN 15332 for instructions.
Gross thermal yield (GTY) of solar devices the solar collectors of which are tested separately	ScenoCalc v6.1, using inputs from ISO 9806:2017 Use prEN 12975:2021, Annex B, Clause B.2.1 for calculation of GTY, Clause B.1.2 and B.3 for the climate reference conditions.	The calculation of GTY must be climate specific (Helsinki/Stockholm, Strasbourg/Würzburg, and/or Athens) and consider orientation and inclination as indicated in Annex VII. The GTY calculated is the summation of the gross thermal yield (GTY) and gross electric yield (GEY) for the average of collector mean temperatures of 25ºC and 50ºC
Water-heating demand $Q_{wh,sol}$	Annex III, point 10	*Qwh,sol* = *Qref* *366*0.6 * (Qref+1.09)
Correction factor $f_{profile}$	Annex III, point 10	
Correction factor *a, b, c* and *d*, for water heating		
Correction factor *a, b* and *c*, for space heating		
Solar device efficiency for water heating $\eta_{sol,wh,clim}$		
Solar device efficiency for space heating $\eta_{sol,sh,clim}$		
Solar-assisted combination heater water heating energy efficiency η_{wh+sol}		

Solar-assisted heater space-heating energy efficiency η_{sh+sol}		
Tank factor f_{tank}		

ANNEX IX

Product compliance verification by market surveillance authorities

1. INTRODUCTION

The verification tolerances set out in this Annex relate only to the verifications conducted by Member State authorities of the declared values and shall not be used by the supplier, importer or authorised representative as an allowed tolerance to: (i) determine the values in the technical documentation or in interpreting those values with a view to achieving compliance; or (ii) communicate better performance by any means.

2. PROCEDURE

As part of verifying the compliance of a product model for the requirements referred to in this Annex, the authorities of the Member States shall apply the procedure set out in points (a) to (g) below.

(a) The Member State authorities shall verify one single unit of the model.

(b) The model shall be considered to comply with the applicable requirements if:

(i) the declared values given in the technical documentation pursuant to Article 3(3) of Regulation (EU) 2017/1369, and, where applicable, the values used to calculate such declared values, are not more favourable for the supplier than the corresponding values given in the test reports;

(ii) the declared values meet all requirements laid down in this Regulation, and any required product information published by the supplier or dealer does not contain values that are more favourable for the supplier or dealer than the declared values; and

(iii) when the Member State authorities test the unit of the model, the determined values (the values of the relevant parameters as measured in testing and the values calculated from these measurements) comply with the respective verification tolerances set out in Table 1.

(c) If the results referred to in point (b)(i) or (ii) are not achieved, the model and all other equivalent models shall be considered not to comply with this Regulation. The Member State authorities shall provide all relevant information to the authorities of the other Member States and to the Commission without delay after a decision is taken on the non-compliance of the model.

(d) If the result referred to in point (b)(iii) is not achieved, the Member State authorities shall select three additional units of the same model for testing. As an alternative, the three additional units selected may be of one or more different equivalent models.

(e) The model shall be considered to comply with the applicable requirements if, for the three units, the arithmetical mean of the determined values complies with the respective verification tolerances set out in Table 1. In addition, for heat-pumps and hybrid heat-pumps tested with the compensation method, there shall be no cycling on/off for any of the test points for at least two of the units.

(f) If the result referred to in point (e) is not achieved, the model and all other equivalent models shall be considered not to comply with this Regulation.

(g) The Member State authorities shall provide all relevant information to the authorities of the other Member States and to the Commission without delay after a decision being taken on the non-compliance of the model in accordance with point (c) or (f).

The Member State authorities shall use the measurement and calculation methods set out in Annex III.

3. VERIFICATION TOLERANCES

The Member State authorities shall only apply the verification tolerances that are set out in Table 1 and shall only use the procedure described in Section 2 for the requirements referred to in this Annex. No other tolerances, such as those set out in harmonised standards or in any other measurement method, may be applied.

Table 1

Verification tolerances

Parameters	**Verification tolerances**
Seasonal space-heating energy efficiency of fuel and electric boilers, η_s	The determined value must not be lower than the declared value by more than 4% (relative tolerance).
Seasonal space-heating energy efficiency of fuel boiler heater with a standard-rated heat output of more than 70 kW and less or equal to 1 MW, η_1 *and* η_4	The determined value must not be lower than the declared value by more than 4% (relative tolerance).
Seasonal space-heating energy efficiency of cogeneration and heat-pump space-heaters, η_s	The determined value must not be lower than the declared value by more than 8% (relative tolerance).
Water-heating energy efficiency, η_{wh}	The determined value must not be lower than the declared value by more than 8% (relative tolerance).
Declared load profile	The measured useful energy content should not be lower than 95% of the value of Qref for the declared load profile.
Sound-power level, L_{WA}	The determined value must not exceed the declared value by more than 2 dB(A).
Seasonal space-cooling energy efficiency of reversible space-heaters, $\eta_{s,c}$	The determined value must not be lower than the declared value by more than 8% (relative tolerance)).
Emissions of nitrogen oxides	The determined value must not exceed the declared value by more than 20%.
Heating and cooling output of heat-pump heater, hybrid heat-pump heater and fuel heat-pump, measured on the liquid side	The tolerance is $(1 + 20 / \Delta\theta)$ % of the heating or cooling output where $\Delta\theta$ is the water temperature difference on the indoor side water heat exchanger

EER, COP, FUEc and FUE of heat-pump heater, hybrid heat-pump heater and fuel heat-pump	The tolerance is $(2 + 20 / \Delta\theta)$ % of the EER, COP, FUEc or FUE, where $\Delta\theta$ is the water temperature difference on the indoor side water heat exchanger
Electric power input for off, thermostat-off, standby and crankcase heater modes of heat-pump heater and hybrid heat-pump heater	The tolerance is • 0,3 W up to 10 W; • 3 % of the measured value for powers greater than 10 W

ANNEX X

Amendment to Regulation (EU) 811/2013:

1. In Annex I, after the subtitle "Definitions related to water heating in combination heaters", the following definition is inserted as definition (55):

(55) 'out of the box-mode' is the standard operating condition, setting or mode set by the manufacturer at factory level, to be active immediately after the appliance installation, suitable for normal use by the end-user according to the water tapping pattern for which the product has been designed and placed on the market. Any change to a different operating condition, setting or mode, if applicable, shall be the result of an intentional intervention by the end-user, and cannot be automatically modified by combination heater at any time, except for smart control function adapting the water heating process to individual usage conditions with the aim of reducing energy consumption.'

2. Annex VII is amended as follows

(a) in point 1 the existing text is replaced by the text below:

'For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards the reference numbers of which have been published for this purpose in the *Official Journal of the European Union*, or using other reliable, accurate and reproducible methods that take into account the generally recognised state-of-the-art methods. They shall meet the conditions and technical parameters set out in points 2 to 6.

The water heating function of every combination heater shall be tested in the 'out of the box-mode.'.

(b) in point 2 on "General conditions for measurements and calculations", the following text is added after point 2 (d):

" 2e) Emissions of nitrogen oxides shall be measured as the sum of nitrogen monoxide and nitrogen dioxide, and expressed in nitrogen dioxide.

A default or reference nitrogen content in the fuel of 140 mg/kg shall be applied. Where another nitrogen content is measured the following correction equation shall apply:

NOx(EN 267)[mg/kWh] = NOxref[mg/kWh] – (Nmeas – Nref) x 0,2

Where:

- NOx(EN 267) is the value of NOx corrected to the reference conditions of nitrogen of the fuel oil chosen at 140 mg/kg;
- EN 267 means CEN standard EN 267:2009+A1:2011
- NOxref is the measured value of NOx according to paragraph B.2 in standard EN 267:2009+A1:2011;
- Nmeas is the value of the nitrogen content of the fuel oil measured in mg/kg;
- Nref is the default or reference nitrogen content, which equals 140 mg/kg.

– The value of NOx(EN 267) is the one to be compared to the maximum NOx emission requirements defined in section 4 of Annex II to Commission Regulation (EU) 813/2013.”.