Disclaimer

This is a working document supporting the discussion of the revision of REGULATION (EU) 813/2013 laying down ecodesign requirements for space heaters. It sets out a draft version of the revised legal text to support the stakeholders' consultation process, in particular the Consultation Forum meeting of 27 April 2023.

Please note that while this draft document has been prepared by DG ENER staff and its consultants, it is by no means an official document endorsed by the European Commission

DRAFT

[XXX/XXXX] Ecodesign regulation space / combination heaters

COMMISSION REGULATION (EU) No [XXX/XXXX] of [XX/XX/XXXX]

implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters, repealing Commission Regulation (EU) No 813/2013 and Council Directive 92/42/EEC

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (1) and in particular Article 15(1) thereof,

After consulting the Ecodesign Consultation Forum,

(1) …

(2) …

HAS ADOPTED THIS REGULATION

[Preamble section, recitals]

Article 1

Subject matter and scope

1. This Regulation establishes ecodesign requirements for the placing on the market and/or putting into service of hydronic central space heaters and combination heaters with a rated heat output ≤ 1 MW, including

- fuel boilers, using gaseous or liquid fuels for heat generation;
- electric boilers, using the Joule effect for heat generation;
- electrically or thermally driven heat pumps, possibly supplemented by an electric resistance back-up heater;
- cogeneration heaters, concurrently generating heat and electricity;
- hybrid heaters, using a combination of an electric heat pump and/or a solar thermal device as well as a fuel boiler for back-up with a hybrid master controller managing the operation of the heat generators.

2. This Regulation shall not apply to:

(a) heaters specifically designed for using gaseous or liquid fuels that are predominantly produced from biomass, unless they are also found fit for using gaseous or liquid fossil fuels;

(b) heaters using solid fuels;

(c) heaters for heating and distributing gaseous heat transfer media such as vapour or air;

(d) heaters within the scope of Directives 2010/75/EU[1] and (EU) 2015/2193[2] of the European Parliament and the Council;

(e) products covered by Commission Regulation (EU) 2015/1188 with regard to ecodesign requirements for local space heaters[3];

[1] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). OJ L 334, 17.12.2010, p. 17–119. Note that this directive includes, amongst others, the recast of the 2001 Large Combustion Plants Directive (LCPD) in Chapter III and referenced Annnexes for combustion plants larger than 50 MW "rated thermal input"

[2] Directive (EU) 2015/2193 of the European Parliament and of the Council of 25 November 2015 on the limitation of emissions of certain pollutants into the air from medium combustion plants. OJ L 313, 28.11.2015, p. 1–19.
Art. 1. This Directive lays down rules to control emissions of sulphur dioxide (SO2), nitrogen oxides (NOx) and dust into the air from medium combustion plants, and thereby reduce emissions to air and the potential risks to human health and the environment from such emissions. This Directive also lays down rules to monitor emissions of carbon monoxide (CO).
Art. 2. 1) This Directive shall apply to combustion plants with a rated thermal input equal to or greater than 1 MW and less than 50 MW ('medium combustion plants'), irrespective of the type of fuel they use.

[3] Commission Regulation (EU) 2015/1188 of 28 April 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for local space heaters (OJ L 193, 21.7.2015, p. 76).

(f) products covered by Commission Regulation (EU) No 2016/2281 with regard to ecodesign requirements for air heating products, cooling products, high temperature process chillers and fan coil units[4];

(g) products covered by Commission Regulation (EU) 2015/1095 with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers[5];

(h) heaters generating heat only for the purpose of providing hot drinking or sanitary water;

(i) cogeneration space heaters with a maximum electrical capacity of 50 kW or above;

(j) reversible heat pump heaters with a rated heat output >400 kW;

Article 2

Definitions

In addition to the definitions set out in Article 2 of Directive 2009/125/EC, the following definitions shall apply for the purposes of this Regulation:

(1) *'heater*' means a hydronic central space heater or combination heater;
(2) '*hydronic central space heater'* (or '*space heater*') means a device that
   (a) provides heat to a hydronic central heating system in order to reach and maintain at a desired level the indoor temperature of an enclosed space such as a building, a dwelling or a room, where 'hydronic central heating system' means a system using water as a heat transfer medium to distribute centrally generated heat to heat emitters for the space heating of buildings, or parts thereof; and
   (b) is equipped with one or more heat generators;

   whereby a heat generator designed for a heater and a heater housing to be equipped with such a heat generator shall be also considered a heater; and

(3) *'combination heater*' (a.k.a. 'combi') means a hydronic central space heater that is designed to also provide hot drinking or sanitary water at given temperature levels, quantities and flow rates during given intervals, and is to be connected to an external supply of drinking or sanitary water;
(4) *'rated heat output*' (P_{rated}) means the declared heat output of a heater when providing space heating and, if applicable, water heating at rating conditions, expressed in kW;
(5) *'rating conditions*' means the operating conditions of heaters under average climate conditions for establishing the rated heat output, seasonal space heating energy efficiency, water heating energy efficiency, sound power level and nitrogen oxide emissions, as defined in Annex I and set out in Annex III;
(6) *'boiler*' means a fuel boiler or electric resistance –Joule effect—boiler;
(7) *'fuel boiler*' is a heater using gaseous or liquid fuels for heat generation;
(8) '*electric boiler'* is a heater that generates heat using the Joule effect in electric resistance heating elements only;

[4] Commission Regulation (EU) 2016/2281 of 30 November 2016 implementing Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for energy-related products, with regard to ecodesign requirements for air heating products, cooling products, high temperature process chillers and fan coil units. OJ L 346, 20.12.2016, p. 1–50
[5] Commission Regulation (EU) 2015/1095 of 5 May 2015 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for professional refrigerated storage cabinets, blast cabinets, condensing units and process chillers. OJ L 177, 8.7.2015, p. 19–51

(9) '*heat pump heate*r' means a heater using a thermodynamic cycle capturing ambient energy, geothermal energy and/or waste heat for heat generation, possibly supplemented by an electric resistance back-up heater;
(10) '*cogeneration heater*' means a heater, simultaneously generating heat and electricity in a single process;
(11) '*heat generator*' means the part of a heater that generates the heat;
(12) '*hybrid heater*' means either and hybrid heat pump or a solar hybrid;
(13) '*hybrid heat pump*' means an encased assembly or assemblies designed as a unit consisting of an electric heat pump, a boiler and a hybrid master controller providing an optimised operation of the heat generators for space heating and possibly water heating;
(14) '*solar hybrid*' means an encased assembly or assemblies designed as a unit consisting of a solar device, a boiler and a hybrid master controller providing an optimised operation of the heat generators for space heating and possibly water heating;
(15) *'solar device*' means a configuration of one or more solar thermal collectors and possibly one or more solar hot water storage tanks, collector pumps and controls, but which is not equipped with a heat generator, except for possibly a back-up immersion heater;
(16) '*heater housing*' means the part of a heater designed to have a heat generator fitted;
(17) *'biomass'* means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste;
(18) '*sound power leve*l' (L_{WA}) means the A-weighted sound power level, indoors and/or outdoors, expressed in dB(A), as set out in Annex III, section 6;
(19) *'conversion coefficien*t' (*CC*) means the default coefficient for primary energy per kWh electricity referred to in Directive 2012/27/EU of the European Parliament and of the Council[6]. The value of the conversion coefficient is *CC* = 1,9.[7]
(20) '*seasonal space heating energy efficiency*' (η_s or *etas*) means the ratio between the space heating demand for the designated heating season, supplied by a heater and the annual energy consumption required to meet this demand, expressed in %;
(21) '*water heating energy efficiency*' (η_{wh} or *etawh*) 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 %;

For the purposes of Annexes II to V, additional definitions are set out in Annex I.

Article 3

Ecodesign requirements and timetable

1. All units placed on the market as from [Date of application]:

(i) heaters shall meet the requirements set out in Annex II, points 1a, 1b, 4a, 4b, 4c, 5and 6;

(ii) among heaters, combination heaters shall also meet the requirements set out in Annex II, point 2;

[6] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC. OJ L 315, 14.11.2012, p. 1–56.
[7] Commission Delegated Regulation (EU) 2022/... on revising the primary energy factor for electricity in application of Directive 2012/27/EU of the European Parliament and of the Council, 15.12.2022

(iii) among heaters, heat pump heaters and hybrid heat pumps shall also meet the requirements set out in Annex II, point 3;

(iv) among heaters, fuel boilers whose first unit is placed on the market on or after [Date of application], including if the fuel boiler is part of an hybrid heater, shall also meet the requirements set out in Annex II, points 4d and 4e;

(v) among heaters, those whose first unit is placed on the market on or after [Date of application], shall also meet the requirements set out in Annex II, point 7;

2. All units placed on the market as from [4 years after Date of application]:

(i) heaters shall meet the requirements set out in Annex II, point 1c.

(ii) heaters shall also meet the requirements set out in Annex II, point 7.

(iii) fuel boilers part of hybrid heaters shall meet the requirements set out in Annex II, points 4d and 4e;

3. Compliance with ecodesign requirements shall be measured and calculated in accordance with the requirements set out in Annex III, following transitional provisions as indicated in Annex IV as appropriate.

Article 4

Conformity assessment

1. For fuel boiler, heat pump and hybrid heater models whose first unit is placed on the market on or after [Date of application], the conformity assessment of the seasonal space heating efficiency shall be certified by an EC-type examination in accordance with module B and by a declaration of conformity to the approved type in accordance with module C, D or E, as described in Annex II of Decision 768/2008/EC[8].
2. For other products and parameters in the scope of this regulation, the conformity assessment procedure referred to in Article 8(2) of Directive 2009/125/EC shall be the internal design control set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.
3. For the purposes of conformity assessment, the technical documentation shall contain the product information set out in point 6(b) of Annex II to this Regulation.

Article 5

Verification procedure for market surveillance purposes

When performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC to ensure compliance with the requirements set out in Annex II to this Regulation, the Member States' authorities shall apply the verification procedure set out in Annex V to this Regulation.

Article 6

Circumvention and software and firmware updates

[8] Decision No 768/2008/EC of the European Parliament and of the Council of 9 July 2008 on a common framework for the marketing of products, and repealing Council Decision 93/465/EEC (Text with EEA relevance) OJ L 218, 13.8.2008, p. 82–128

1. Manufacturers, importers or authorised representatives shall not place on the market products designed to be able to detect they are being tested (for example by recognising the test conditions or test cycle) and to react specifically by automatically altering their performance during the test with the aim of reaching a more favourable level for any of the parameters in the technical documentation or included in any documentation provided.
2. Manufacturers, importers or authorised representatives shall not prescribe test instructions, specifically for when product are being tested, that have the effect of altering the behaviour or properties of those products in order to obtain a more favourable result for any of the declared values of the parameters set out in this Regulation.
3. Manufacturers, importers or authorised representatives shall not place on the market or put into service products designed to alter their behaviour or properties within a short period after being put into service resulting in a degrading of any of the declared values of the parameters set out in this Regulation.
4. The energy consumption of the product and any of the other declared parameters shall not deteriorate after a software or firmware update when measured with the same test standard originally used for the declaration of conformity, except with explicit consent of the end-user prior to the update. No performance change shall occur as a result of rejecting the update.
5. A software update shall never have the effect of changing the product's performance in a way that makes it noncompliant with the ecodesign requirements set out in this Regulation applicable at the time of the placing on the market or putting into service of the appliance.

Article 7

Indicative benchmarks

The indicative benchmarks for best-performing heaters available on the market at the time of entry into force of this Regulation are set out in Annex VI.

Article 8

Review

1. The Commission shall review this Regulation in the light of technological progress with heaters and present the result of that review to the Ecodesign Consultation Forum no later than five years from the date of entry into force of this Regulation. In particular, the review shall include an assessment of the following aspects:

(a) the appropriateness of setting stricter ecodesign requirements for the seasonal space heating energy efficiency of space heaters and combination heaters of all types and for the water heater energy efficiency of combination heaters, for the sound power level and for emissions of nitrogen oxides;

(b) the appropriateness of setting ecodesign requirements for heaters specifically designed for using gaseous or liquid fuels predominantly produced from biomass;

(c) the validity of the conversion coefficient value;

(d) the appropriateness of third-party certification and monitoring;

2. The Commission shall review this Regulation in the light of the development of alternative test methods for measuring seasonal space heating energy efficiency of heaters and present the results of this assessment, including, if appropriate, a draft revision proposal, to the Consultation Forum no later

than three years from the date of entry into force of this Regulation. In particular, the review shall include the following aspects:

(a) a review of existing standards and ongoing standardisation work for the establishment of seasonal space heating energy efficiency, including the effect of the control of the heater on energy efficiency and the possibility to avoid the need of information from the manufacturer on the setting of the unit to be applied;
(b) how the ecodesign requirements regarding energy efficiency would be affected by changes in the test methods applied;

Article 9

Repeal

Commission Regulation (EU) No 813/2013 shall be repealed with effect from [Date of application].

Council Directive 92/42/EEC shall be repealed with effect from [4 years after Date of application].

Article 10

Entry into force

This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.

It shall apply from 1 September 2025, with the exception of provisions indicated to apply four years after date of application, which shall then apply as from 1 September 2029.

However, article 6 shall apply from [OP – please insert date – entry into force of this Regulation].

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, XX Month XXXX.

For the Commission

The President

Ursula VON DER LEYEN

ANNEX I

Definitions applicable for Annexes II to VI

For the purposes of Annexes II to VI the following definitions shall apply, whereby all definitions for 'heaters' relate to space heaters and combination heaters in space heating mode except for definitions explicitly related to water heating in combination heaters.

Definitions related to heaters

(1) 'standby mode' means a condition where the heater is connected to the mains power source, depends on energy input from the mains power source to work as intended and provides only the following functions, which may persist for an indefinite time: reactivation function, or reactivation function and only an indication of enabled reactivation function, and/or information or status display, including network standby;

(2) 'networked standby' means a condition in which the equipment is able to resume a function by way of a remotely initiated signal from a network connection;

(3) 'network means a communication infrastructure with a topology of links, an architecture, including the physical components, organisational principles, communication procedures and formats (protocols);

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

(5) 'average climate conditions' means the temperature conditions during the heating season as a proxy for the average European Union climate, as expressed by the frequency, in hours, of the outdoor temperature bin values, rounded to the nearest integer as given in Table 5;

(6) 'temperature control' means the equipment that interfaces with the end-user regarding the values and timing of the desired indoor temperature, and communicates relevant data to an interface of the heater such as a central processing unit, thus helping to regulate the indoor temperature(s);

(7) 'supplementary heater' means a heater that generates heat in conditions where the heat demand is greater than the maximum heat output of the preferential heater(s);

(8) '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;

(9) 'equivalent model' means a model placed on the market with the same technical parameters set out in Table 1 of Annex II as another model placed on the market by the same manufacturer;

Definitions related to fuel boilers and cogeneration heaters

(10) 'B1 boiler' 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; a type B1 boiler is marketed as type B1 boiler only;

(11) 'B1 combination boiler' means a B1 boiler designed to operate as a combination heater;

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

(13) ‘useful efficiency’ (η) means the ratio of the useful heat output and the total energy input of a boiler or cogeneration heater, expressed in %, whereby the total energy input is expressed in terms of GCV and/or in terms of final energy multiplied by *CC*;

(14) ‘useful heat output’ (*P*) means the heat output of a boiler or cogeneration space heater transmitted to the heat carrier, expressed in kW;

(15) ‘nominal heat input’ (P_{hs}) of a boiler or cogeneration heater means the quantity of energy used in unit time corresponding to the volumetric or mass flow rates, the calorific value used in this regulation being the gross calorific value (GCV), as declared by the manufacturer in the instructions for installation, expressed in kW.

(16) ‘rated heat output’ (P_4 or $P_{rated,fb}$) of a fuel boiler, electric boiler or cogeneration heater means the useful heat output at a high-temperature regime with 60°C return and 80°C feed temperature, expressed in kW, for a fuel boiler or cogeneration heater at nominal heat input P_{hs} and for an electric boiler at declared nominal electric power input, as set out in Annex III, section 4, sub (a) to (c).

(17) 'design load' (Pdesign) of a fuel boiler, expressed in kW, is the rated heat output P4 multiplied by 800 and divided by 2066, as used in Annex III, section 8;

(18) ‘part load output’ (P_1) of a fuel boiler means the useful heat output at 30% of the nominal heat input P_{hs} at a low-temperature regime with 30°C return temperature, expressed in kW, as used in Annex III, section 4, sub (a);

(19) ‘minimum part load output’ (P_0) of a fuel boiler means the useful heat output with the lowest thermal input declared by the manufacturer that can be achieved without on/off cycling at a low-temperature regime, expressed in kW;

(20) ‘efficiency at nominal heat input’ (η_4 or eta_4) of a fuel boiler means the ratio between rated heat output and nominal heat input, as used in Annex III, section 4, sub (a) to (c);

(21) ‘efficiency at 30% heat input’ (η_1 or eta_1) means the ratio between part load output and 30% of the nominal heat input P_{hs}, as used in Annex III, section 4, sub (a) to (c);

(22) ‘efficiency at minimum heat input’ (η_0 or eta_0) means the ratio between lowest part load and nominal thermal input P_{hs} for continuous operation;

(23) ‘electrical efficiency’ (η_{el}) means the ratio of the electricity output and the total energy input of a cogeneration space heater, expressed in %, whereby the total energy input is expressed in terms of *GCV* and/or in terms of final energy multiplied by *CC*;

(24) ‘seasonal space heating energy efficiency’ (η_s or eta_s) means ratio between the space heating demand for a designated heating season, supplied by the boiler and the annual energy consumption based on GCV required to meet this demand, as set out in Annex III, section 3;

(25) ‘seasonal space heating energy efficiency in active mode’ (η_{son} or $etas_{on}$) means the seasonal space heating energy efficiency during the hours with a space heating load whereby the heating function of the unit is activated, possibly involving on/off cycling of the unit to reach or maintain a required instantaneous heat load, as set out in Annex III, section 4;

(26) ‘control correction *F(1)*’ means a correction for a basic temperature control, subtracting 3%-percentage points from the seasonal space heating energy efficiency, as set out in Annex III, section 5;

(27) ‘auxiliary electricity consumption’ means, for the purpose of the efficiency calculations in this regulation, the annual electricity consumed by the system components such as fan, valves, heating elements required for the heat generator designated operation, but not the circulation pump, expressed in kWh/a, as set out in Annex III, section 5;

(28) ‘full load auxiliary power’ (*elmax*) means the electric power consumption, as part of the electric auxiliary energy, at full load P_4 of a fuel boiler or cogeneration heater, expressed in kW, as set out in Annex III, section 5, sub (a);

(29) ‘part load auxiliary power’ (*elmin*) means the electric power consumption, as part of the electric auxiliary energy, at part load P_1 of a fuel boiler or cogeneration heater, expressed in kW;

(30) ‘auxiliary electricity correction’ *F(2)* or *F(2)*’ means the electric auxiliary consumption as a fraction, expressed in %, of the total annual energy consumption of heater, which for boilers and cogeneration heaters is calculated from *elmax*, *elmin* and P_{SB} as appropriate and relates, corrected with *CC* to primary energy equivalent, whereas for water(brine)-source heat pumps *F(2)’* accounts for the auxiliary electricity consumption of the ground source pump with a default fraction of 5%, as set out in Annex III, section 5, sub (a);

(31) ‘standby heat loss’ (P_{stby}) means the heat loss of a boiler in operating modes without heat demand, expressed in kW, as set out in Annex III, section 5, sub (a);

(32) ‘standby heat loss correction *F(3)*’ means a correction for the standby heat loss of boilers and cogeneration heaters, as set out in Annex III, section 5, sub (b);

Definitions related to heat pump and hybrid heat pumps

(33) ‘heat pump heat source’ designates the types of heat pump by the type of fluid and/or heat exchanger type used at the evaporator side: outdoor air (abbreviated as ‘air’), ventilation exhaust air (abbreviated as 'exhaust air’), ground heat exchanger (abbreviated as ‘brine’), ground water (abbreviated as ‘water’), ground direct exchange (abbreviated as 'direct exchange’). ‘reversible heat pump heater’ means a heat pump heater capable of both cooling and heating;

(34) ‘design load’ of a heat pump or hybrid heater ($P_{designh}$) means the space heating output at reference design conditions, as declared by the manufacturer, expressed in kW;

(35) ‘reference design conditions’ means the combination of the reference design temperature, the maximum bivalent temperature and the maximum operation limit temperature as well as, for air-to-water heat pump heaters (also) using exhaust air, the maximum availability of exhaust air volume rates at $P_{designh}$, as given in Annex III, Table 2;

(36) ‘reference design temperature’ ($T_{designh}$) means for space heating the outdoor temperature at which the part load ratio is equal to 1 (100%), expressed in degrees Celsius;

(37) ‘operation limit temperature’ (*TOL*) means the outdoor temperature below which the declared heat pump capacity is equal to zero;

(38) 'bivalent temperature' (T_{biv}) means lowest outdoor temperature point at which the heat pump is declared to have a capacity able to meet 100 % of the heating load without supplementary heater, expressed in degrees Celsius;

(39) 'rated heat output of a heat pump' ($P_{rated,\ hp}$) means the useful heat output of the heat pump at *TOL* or $T_{designh}$, in average climate conditions, whichever is highest, in kW;

(40) 'rated heat output of a hybrid heater' ($P_{rated,hyb}$) means the sum of $P_{rated,hp}$ for the heat pump part of the hybrid heater and, as appropriate, $P_{rated,fb}$ for the fuel boiler part of the hybrid heater, in kW;

(41) 'reference annual heating demand' (Q_H) means the reference heating demand for a designated heating season, 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, as set out in Annex III, 3 sub (b);

(42) 'annual equivalent active mode hours' (H_{eH}) means the assumed annual number of 2066 hours a heat pump heater has to provide the design load for heating to satisfy the reference annual heating demand, expressed in h, as set out in Annex III, Table 3;

(43) '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*, as set out in Annex III, section 3, sub (b) and (c);

(44) '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, as set out in Annex III, Table 5 for the reference 'Average' climate;

(45) 'bin' (*bin j*) means a combination of an outdoor temperature and a number of bin hours, as set out in Annex III, Table 5;

(46) '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;

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

(48) 'bin hours' (H_j) means the hours per heating season, expressed in hours per year, at which an outdoor temperature occurs for each bin, as set out in Annex III, Table 5;

(49) 'part load for heating' ($Ph(T_j)$) means the heating load at a specific outdoor temperature, calculated as the design load multiplied by the part load ratio, expressed in kW;

(50) 'part load conditions' is the set of temperature conditions for testing at part loads A, B, C, D, E, F as set out in Annex III, Table 4;

(51) 'declared capacity for heating' ($Pdh(T_j)$) means the declared heating capacity a heat pump heater is able to deliver, for an outdoor temperature T_j , expressed in kW;

(52) 'declared coefficient of performance' ($COPd(T_j)$) or 'declared primary energy ratio' ($PERd(T_j)$) means the declared coefficient of performance or primary energy ratio at the designated bins at T_j of the part load conditions;

(53) 'gas utilisation efficiency' (*GUE(Tj)*) 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;

(54) 'auxiliary electricity factor' (*AEF(Tj)*) is the ratio between the part load $Ph(T_j)$ and the electric power input at a specific outdoor temperature T_j, expressed in kW/kW;

If $Pdh(Tj) > Ph(Tj)$ then on/off cycling shall take place for the heat pump heater to meet the heat load $Ph(Tj)$ in the bin *j* pertaining to the part load conditions for the heat pump heater. In that case and for bin *j* the declared *COPd(Tj)* or *PERd(Tj)* shall be corrected, using *CR* and *Cdh*. If $Pdh(Tj) \leq Ph(Tj)$ for any part load condition then proceed to the calculation of SCOPon, which is the number-of-hours-per-bin weighted average of *COPbin(Tj)* supplemented by an integrated or assumed external electric resistance heater with capacity *elbu(Tj)* to fill in the capacity $Ph(Tj)$.

(55) 'capacity ratio' (*CR*) is the part load for heating $Ph(T_j)$ divided by the declared heating capacity $Pdh(T_j)$ of the unit at the same temperature T_j condition;

(56) 'cycling' is the condition where the capacity ratio *CR* is smaller than 0,9 and the unit will cycle on/off to reach the required part load $Ph(T_j)$;

(57) 'degradation coefficient' ($Cdh(T_j)$) means the measure of efficiency loss due to cycling of heat pump heaters; if *Cdh* is not determined by measurement then the default degradation coefficient is *Cdh* = 0,9;

(58) 'adjusted outlet temperature for cycling' ($T_{cyc}(T_j)$) means the outlet temperature in on-mode during on/off cycling of a heat pump heater;

(59) 'cycling interval capacity for heating' ($Pcyc(T_j)$) means the integrated heating capacity in on-mode over the cycling test interval for heating, expressed in kW;

(60) 'verification test settings' means the set of manufacturer instructions and exact settings used to arrive at the declared efficiency data, as required in Annex II, point 8;

(61) 'water flow rate setting evaporator side' ($q_{we}(T_j)$) means the manufacturer declared water flow rate at the evaporator side during the test at part load condition for (Tj), in m³/h,

(62) 'water flow rate setting condenser side' ($q_{wc}(T_j)$) means the manufacturer declared water flow rate at the condenser side during the test at part load condition for (Tj), in m³/h,

(63) 'bin-specific coefficient of performance' ($COP_{bin}(T_j)$) or 'bin-specific primary energy ratio' ($PER(T_j)$) means the coefficient of performance of the heat pump heater using electricity, or primary energy ratio of the heat pump heater using fuel, 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;

(64) 'active mode coefficient of performance' ($SCOP_{on}$) or 'active mode primary energy ratio' ($SPER_{on}$) means the weighted average coefficient of performance of an electric heat pump heater or the average primary energy ratio of a thermally driven heat pump heater in the designated heating season;

(65) 'active mode seasonal gas utilisation efficiency '(*SGUE*) means the seasonal *GUE*, calculated as the hour (h_j) weighted average of $GUE(T_j)$ over the designated heating season, expressed in kW/kW, as used in Annex III, section 3, sub (c);

(66) '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, as set out in Annex III, section 3, sub (c);

(67) '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;

(68) '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;

(69) 'seasonal primary energy ratio' (*SPER*) means the annual average primary energy ratio of a thermally driven heat pump space heater in the designated heating season, calculated from the SGUE and SAEF whereby the latter is converted to primary energy using *CC*, as set out in Annex III, section 3, sub (c);

(70) 'electric resistance back-up heater capacity' ($elbu\ (T_j)$) means the heat output of a supplementary electric resistance heater 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, as used in Annex III, section 4, sub (d);

(71) 'fuel supplementary heater capacity' ($fuelbu(T_j)$) of a hybrid heater means the heat output of a fuel heater supplementing the declared hybrid 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, as explained in Annex III, section 2, sub (b);

(72) 'capacity control' means the ability of the heat pump heater to change its capacity by changing the volumetric flow rate of the refrigerant;

(73) 'active mode' or 'on mode' means the condition corresponding to the hours with a heating load for the enclosed space and activated heating function; this condition may involve cycling of the heat pump space heater or heat pump combination heater to reach or maintain a required indoor air temperature;

(74) 'off mode' means a condition in which the heat pump heater is connected to the mains power source and is not providing any function, including conditions providing only an indication of off mode condition and conditions providing only functionalities intended to ensure electromagnetic compatibility pursuant to Directive 2014/30/EU of the European Parliament and of the Council [9];

(75) 'thermostat-off mode' of a 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;

(76) 'crankcase heater mode' means the condition in which a heating device is activated to avoid the refrigerant migrating to the compressor so as to limit the refrigerant concentration in oil when the compressor is started;

(77) 'off mode power consumption' (P_{OFF}) means the power consumption of a heat pump heater in off mode, expressed in kW;

[9] 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 (recast)

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

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

(80) ‘hours in various operating modes’ is 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 heater mode (H_{CK}) for reversible and heating-only heat pump heaters, as set out in Annex III, Table 3;

(81) ‘additional auxiliary electricity consumption’(Q_{aux}) of a heat pump heater, stand-alone or as part of a hybrid heater, means the annual auxiliary electricity consumption, in kWh/a, in thermostat-off mode, standby mode, off mode and crankcase heater mode from measured power and default hours in each mode, as set out in Annex III, section 5;

(82) ‘LT heat pump heater’ means a heat pump heater declared to be capable of being used in a low-temperature application;

(83) ‘MT heat pump space heater’ means a heat pump heater declared to be capable of being used in a medium-temperature application;

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

(85) ‘low-temperature 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 specific water outlet temperature per part load condition as indicated in the rows marked 'LT', as set out in Annex III, Table 4;

(86) ‘medium temperature 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 specific water outlet temperature per part load condition as indicated in the rows marked 'MT', as set out in Annex III, Table 4;

(87) ‘high temperature application’ means an application where the heat pump heater delivers heating at an indoor heat exchanger outlet temperature of 65 °C at design temperature, and at specific water outlet temperature per part load condition;

(88) ‘maximum ventilation exhaust air flow rate for space heating’ ($q_{v,maxh}$) is the maximum flow rate of exhaust air at temperature conditions, as set out in Annex III, Table 2, that can be used when assessing the space heating efficiency;

(89) 'switch temperature boiler off' ($T_{fb,off}$) for a hybrid heater means the outdoor air temperature above which the fuel boiler is not providing any heating capacity as it is switched off by the controls and heat is only provided by the heat pump, as set out in Annex III, 2(b);

(90) 'switch temperature heat pump off' ($T_{hp,off}$) for a hybrid heater means the outdoor air temperature below which the heat pump is switched off and the heating capacity is only provided by the fuel boiler, as set out in Annex III, 2(b);

Definitions related to water heating in combination heaters

(91) ‘load profile’ means a declared sequence of water draw-offs, as specified in Annex III, Table 8; each combination heater meets at least one load profile, as set out in Annex III, section 6;

(92) ‘water draw-off’ means a given combination of useful water flow rate, useful water temperature, useful energy content and peak temperature, as specified in Annex III, Table 8;

(93) ‘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 III, Table 8;

(94) ‘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 III, Table 8;

(95) ‘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 III, Table 8;

(96) ‘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;

(97) ‘peak temperature’ (T_p) means the minimum water temperature, expressed in degrees Celsius, to be achieved during water draw-off, as specified in Annex III, Table 8;

(98) ‘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 III, Table 8;

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

(100) ‘declared load profile’ means the tapping load profile applied for conformity assessment;

(101) ‘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;

(102) ‘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.

(103) ‘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;

(104) ‘annual fuel consumption’ (AFC) means the annual fossil fuel and/or biomass 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;

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

(106) ‘smart control compliance’ ($smart$) means the measure of whether a combination heater equipped with smart controls fulfils the water heating performance criterion set out in Annex III, section 7, sub (g);

(107) ‘smart control factor’ (SCF) means the water heating energy efficiency gain due to smart control under the conditions set out in Annex III, section 7, sub (g);

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

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

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

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

(112) ‘Passive Flue Heat Recovery Device’ (*PFHRD*) 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 III, section 7;

(113) 'direct PFHRD contribution' energy contribution by the *PFHRD* to domestic hot water production recovered from flue gas energy during domestic hot water production, as set out in Annex III, section 7, sub (f);

(114) 'indirect PFHRD contribution' energy contribution by the *PFHRD* to domestic hot water production recovered from flue gas energy during domestic central heating production;

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

(116) ‘package correction factor for the heat pump water heating efficiency per heat source’ (fCOPwh) as set out Annex III, section 10, sub (b).

Definitions related to solar devices, hybrid solar and hot water storage tanks

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

(118) '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 III, section 7, calculated as the simple average of the thermal yield for the 25ºC and 50ºC collector operating temperature, in kWh/a;

(119) ‘Gross area’(*Ag*) means the maximum projected area covered by the outer dimensions of the collector array, expressed in m²;

(120) ‘solar device efficiency factor for space heating’ ($\eta sol,sh$) means a factor (>1) for the contribution of a solar device to the seasonal space heating efficiency of a space heater in a package, as set out in Annex III, section 7, sub (c) and section 9;

(121) ‘package of heater and solar device’ means a package offered to the end-user containing one or more space heaters combined with one or more solar devices;

(122) ‘package of combination heater and solar device’ means a package offered to the end-user containing one or more combination heaters combined with one or more solar devices;

(123) ‘solar device efficiency factor for water heating’ ($\eta sol,wh$) 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 III, section 7, sub (c) and section 9;

(124) ‘tank correction 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 III, sections 9 and 10;

(125) ‘water heating efficiency of a solar-assisted combination heater’ (η_{wh+sol}) is the water heating efficiency of a package of a combination heater and a solar device, in %;

(126) 'non solar heat required' *Qnonsol* is the part of the annual water heating demand which is not covered by the solar device yield and therefore must be provided by the combination heater, in kWh/a;

(127) 'annual solar water heating demand' *Qwh,sol* is the water heating demand per year to be met by the combination of solar device and combination heater, in kWh/a;

(128) 'solar heat delivered' *Qsol* is the part of the annual water heating demand which is covered by the solar device yield, in kWh/a;

(129) ‘thermosiphon / ICS solar device’ means a solar device with at least a solar thermal collector, a hot water storage tank and a back-up immersion heater, which is not equipped with a water heater, of which the solar collector(s) and hot water storage tank form an inseparable unit or have been tested in unison in order to determine the solar device efficiency, and which is placed on the market as a single unit;

(130) ‘mixed water at 40°C’ (*V40*) of a hot water storage tank, expressed in litres, is the equivalent of 40°C water that the tank can deliver in standard conditions;

(131) ‘equivalent volume’ (*Veq)*, in litres, of a PCM tank or other storage facility capable of producing hot water at temperatures of 65°C, derived from *V40*.

Definitions related to monitoring of real-world energy efficiency

(132) ‘real-world energy consumption’ means the energy consumed by a heat generator and auxiliary equipment if applicable, for a given time period and function; In case multiple heat generators are using the same energy source (electricity, fuels) the energy consumed may be summed;

(133) ‘real-world heat delivered’ means the heat delivered to a space heating system or domestic hot water by a heat generator, for a given time period and function; In case multiple heat generators are using the same energy source (electricity, fuels) the heat delivered may be summed;

(134) ‘real-world energy efficiency’ means the ratio between the real-world heat delivered and the real-world energy consumed expressed in %, for a given time period, function and per heat generator;

(135) ‘real-world operating times’ means the time the heater actively converted electricity or fuels into heat, for a given time period, function and energy type (fuel, electricity);

(136) ‘on/off cycle’ means the event when the heating element of a fuel based heater, or the compressor of a heat-pump switch from an on-state to the off-state.

(137) ‘real-world data’ means the information referred to in points a) to k) of Annex II point 7 that has been determined and stored by the heater.

(138) ‘real-time data’ means instantaneous real-world data determined by the heaters’ measurement and calculation system, using its highest possible frequency. For the sake of visualisation or processing, an appropriate averaging period, for example of one second, shall be applied.

(139) ‘historical real-world data’ means cumulative or average real-world data, determined for a given time period.

ANNEX II

Ecodesign requirements

1. REQUIREMENTS FOR SEASONAL SPACE HEATING ENERGY EFFICIENCY

(a) The minimum seasonal space heating energy efficiency ηs (in %) of the specified heaters in the average climate conditions is given in the table below.

Para-meter	**heater**	ηs **in %**
A	B1 Fuel boiler ≤10 kW & combi boiler ≤30 kW	76
B	Fuel boiler ≤ 70 kW	87
C	Fuel boiler > 70 kW ≤ 1 MW (η1 and η4)	87 ($\eta 1$) 95 ($\eta 4$)
D	Electric (combi) boiler	48
E	Cogeneration space heaters <50 kWel	115
F	Hybrid heat pump/solar hybrid, MT	125
G	Thermally Driven (TD) heat pump, MT	120
H	Thermally Driven (TD) heat pump, LT	125
I	Electric heat pump, MT (Medium Temperature)	145
J	Electric heat pump, LT (Low Temperature)	170

(b) If a fuel boiler or an electric boiler is sold as part of a hybrid heater, it shall be marked as such on its name plate, specifying serial numbers of heat pump and/or solar devices with which it is combined when placed on the market.

(c) The minimum seasonal space heating energy efficiency ηs, (in %) of the specified space heaters in the above table that are lower than 115% are raised to 115%, implying that heaters that cannot achieve this minimum shall no longer be placed on the market.

2. REQUIREMENTS FOR WATER HEATING ENERGY EFFICIENCY

The water heating energy efficiency of specified combination heaters, in % for specified tapping profiles defined in Annex III, shall not be lower than the values given in the table below.

Combination heater type	**Declared tapping profiles* (S to XXL)**						
	S	**M**	**L**	**XL**	**XXL**	**3XL**	**4XL**
electric combination boiler	42	48	49	49	50	130	130
electric heat pump combination heater	66	88	99	99	127		
fuel combination boiler & hybrid	50	65	70	80	88	88	88
thermally driven heat pump combination	56	67	79	90	97	100	100
B1 fuel combination boiler	61	66	72	77	83	80	80
cogeneration combination heater	50	62	75	86	111	105	105

**= tapping profile S is the smallest multi-point tapping profile available for water heating efficiency testing and smaller profiles cannot be declared for combination heaters.*

3. REQUIREMENTS FOR SOUND POWER LEVEL

The sound power level of heat pump heaters and hybrid heat pumps shall not exceed the following values when providing space heating.

Heat output at part load condition C, as set out in Annex III, Table 4	**Sound power level (L_{WA}), indoors**	**Sound power level (L_{WA}), outdoors**
≤ 6 kW	60 dB	65 dB
> 6 kW and ≤ 12 kW	65 dB	70 dB
> 12 kW and ≤ 30 kW	70 dB	78 dB
> 30 kW	80 dB	88 dB

4. REQUIREMENTS RELATED TO EMISSIONS

(a) For boilers using second family gases, to be tested with G20 reference gas, and boilers only used with G25 test gas, the emissions of nitrogen oxides, expressed in nitrogen dioxide, of heaters shall not exceed the following values.

Heater type	Maximum NOx emissions in mg/kWh fuel input
Fuel boiler space heater and fuel boiler combination heaters using gaseous fuels (*)	56
Fuel boiler space heater and fuel boiler combination heaters using liquid fuels (*)	120
Cogeneration space heaters with external combustion using gaseous fuels	70
Cogeneration space heaters with external combustion using liquid fuels	120
Cogeneration space heaters with internal combustion engine gaseous fuels	240
Cogeneration space heaters with internal combustion engine liquid fuels	420
Heat pump space heaters and heat pump combination heaters equipped with external combustion engine using gaseous fuels	70
Heat pump space heaters and heat pump combination heaters equipped with external combustion engine using liquid fuels	120
Heat pump space heaters and heat pump combination heaters equipped with an internal combustion engine using gaseous fuels	240
Heat pump space heaters and heat pump combination heaters equipped with an internal combustion engine using liquid fuels	420

(*) This includes fuel boilers in hybrid heaters.

(b) For boilers (including boilers in hybrid heaters) using only third family gases, to be tested with G30 reference gas, the emissions of nitrogen oxides, expressed in nitrogen dioxide, of heaters shall not exceed the limit values for second family gases in the table above, multiplied by a factor 1,30.

(c) For boilers (including boilers in hybrid heaters) using only propane, to be tested with G31 reference gas, the emissions of nitrogen oxides, expressed in nitrogen dioxide, of heaters shall not exceed the limit values for second family gases in the table above, multiplied by a factor 1,20.

d) gas-fired combination boilers (including combination boilers in hybrid heaters), with the exemption of B1 boilers, with rated heat output ≤70 kW shall be able to modulate their heat output down to 20% of the rated heat output of the boiler for space heating without on/off cycling;

e) liquid fuel fired combination boilers ≤70 kW (including combination boilers in hybrid heaters), with the exemption of B1 boilers, shall be able to modulate their heat output back to 25% of the rated heat output of the boiler for space heating without on/off cycling;

5. REQUIREMENTS FOR MATERIAL RESOURCE EFFICIENCY

Manufacturers, importers or authorised representatives of heaters shall ensure that:

(1) Availability of necessary spare parts.

(a) Manufacturers, importers or authorised representatives shall make available to professional repairers, spare parts (or compatible parts) for at least, the following components:

- *circulator (including flow rate control),*
- *ignition spark plugs, sensors (including thermostats, pressure gauge),*
- *electric fuses,*
- *proprietary seals and connection means (special bolts, nuts, washers, clamps),*
- *fan motors,*
- *compressors,*
- *burners,*
- *printed circuit boards,*
- *electrically operated valves (3-way valve, gas valve),*
- *solar panels as appropriate,*

Note that, after [4 years after the Date of Application] a fuel boiler or electric Joule boiler cannot be placed on the market as a stand-alone product nor as 'spare part' of a hybrid product. It can only be placed on the market together with a heat pump and/or solar device that are appropriate to meet the minimum efficiency limit of a hybrid as indicated in Annex II, point 2.

(b) Availability of spare parts or compatible parts referred to in point (a), shall be ensured for a minimum period starting at the latest on [Date of application] or three months after the placing on the market of the first unit of the model, whichever is the latest, and ending at least, 10 years after placing the last unit of the concerned model on the market. For this purpose, the list of spare parts, the procedure for ordering them and the repair and maintenance information shall be publicly available on the free access website of the manufacturer, importer or authorised representative, at least during the minimum period indicated above;

(c) Manufacturers, importers or authorised representatives of heaters shall ensure that the spare parts mentioned in point 1 (a) can be replaced with the use of commonly available tools and without permanent damage to the heater.

(2) Maximum delivery time of spare parts

During the periods mentioned under 1 (b), the manufacturer, importer or authorised representative shall ensure sending of the spare parts within 10 working days after having received the order.

(3) Access to repair and maintenance information

During the periods mentioned under 1 (b), the manufacturer, importer or authorised representative shall provide access to the repair and maintenance information to professional repairers in the following conditions:

(a) the manufacturer's, importer's or authorised representative's website shall indicate the process for professional repairers to register for access to the repair and maintenance information; to

accept such a request, the manufacturers, importers or authorised representatives may require the professional repairer to demonstrate that:

(i) the professional repairer has the technical competence to repair heaters and complies with the applicable regulations for repairers of the heaters in the Member States where it operates. Reference to an official registration system as professional repairer, where such system exists in the Member States concerned, shall be accepted as proof of compliance with this point;

(ii) the professional repairer is covered by insurance covering liabilities resulting from its activity regardless of whether this is required by the Member State.

(b) The manufacturers, importers or authorised representatives shall accept or refuse the registration within 5 working days from the date of request;

(c) Manufacturers, importers or authorised representatives may charge reasonable and proportionate fees for access to the repair and maintenance information or for receiving regular updates. A fee is reasonable if it does not discourage access by failing to take into account the extent to which the professional repairer uses the information.

(d) Once registered, a professional repairer shall have access, within one working day after requesting it, to the requested repair and maintenance information. The information may be provided for an equivalent model or model of the same family, if relevant.

(e) The heater repair and maintenance information referred to in (a) shall include:

- the unequivocal heater identification;
- a disassembly map or exploded view;
- technical instructions for repair;
- list of necessary repair and test equipment;
- component and diagnosis information (such as minimum and maximum theoretical values for measurements);
- wiring and connection diagrams;
- diagnostic fault and error codes (including manufacturer-specific codes, where applicable); and
- instructions for installation of relevant software and firmware including reset software.
- information on how to access data records of reported failure incidents stored on the heater (where applicable).

(4) Requirements for dismantling for material recovery and recycling while avoiding pollution.

Manufacturers, importers or authorised representatives shall ensure that heaters are designed in such a way that the materials and components referred to in Annex VII to Directive 2012/19/EU ([10]) can be removed with the use of commonly available tools.

Manufacturers, importers or authorised representatives shall fulfil the obligations laid down in Point 1 of Article 15 of Directive 2012/19/EU.

[10] Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE). OJ L 197, 24.7.2012, p. 38–71

6. REQUIREMENTS FOR PRODUCT INFORMATION

The following product information shall be provided:

(a) the instruction manuals for installers and end-users, and free access websites of manufacturers, their authorised representatives and importers shall contain the following information:

(1) the technical parameters set out in Table 1, defined in Annex I, measured and calculated in accordance with Annex III, as appropriate supplemented by transitional methods in Annex IV, with the following specific instructions:

i. The section named "General information" of Table 1 is mandatory for all heaters;

ii. All section A data of Table 1 are to be filled in, as appropriate for electric heat pumps and the electric heat pump part of hybrids, except where cells are exclusively reserved for parameters of thermally driven (TD) heat pumps (*SAEFon and NOx)* or apply only to ventilation exhaust heat pumps ('*ventilation only'* parameters). For electric heat pumps, the cells indicated as [*COPd, GUEd], [COPbin, GUEbin]*, [*SCOPon, SGUEon]* and [*elbu, fuelbu]* are *respectively to be filled with COPd, COPbin, SCOPon and elbu values*;

iii. For thermally driven heat pumps, *SAEFon and NOx* in section A do apply. The cells indicated as [*COPd, GUEd], [COPbin, GUEbin]*, [*SCOPon, SGUEon]* and [*elbu, fuelbu]* are *respectively to be filled with GUEd, GUEbin, SGUEon and fuelbu values*;

iv. For electric heat pumps that are part of a hybrid heat pump the required supplementary capacity of the supplementary fuel heater per part load condition is required in the column *fuelbu* (shared with elbu) of section A. Note that the seasonal efficiency etas of a hybrid heater is to be given in the section B, which includes information on the supplementary fuel boiler part of the hybrid;

v. All section B parameters, except for the cogeneration parameters *Pel* and *Phs*, apply to fuel boilers, both stand-alone boilers and boilers that are part of a hybrid heater. This includes the declaration of the indoor/outdoor sound power LWA.

vi. For electric boilers in section B, only *P4, eta4, PSB, Pstby* and *etas* apply.

vii. For cogeneration heaters in section B, *P4, Qhs, Pel, elmax, PSB, Pstby* and *etas* are to be declared, as well as the indoor/outdoor sound power LWA.

viii. Section C parameters apply to all types of combination heaters, except for those tested for the contribution of an indirect PFHRD, which only applies if there is a PFHRD in the heater and if the heater produces hot flue gases.

ix. The manufacturer shall indicate how to access the information allowing the independent setting of the units to establish the regulated parameters. This information shall be available upon request to any test laboratories in less than five days.

(2) any specific precautions that shall be taken when the heater is assembled, installed or maintained;

(3) for type B1 boilers and type B1 combination boilers, their characteristics and the following standard text: '*This natural draught boiler 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.'*;

(4) for heat generators designed for heaters, and heater housings to be equipped with such heat generators, their characteristics, the requirements for assembly, to ensure compliance with the

ecodesign requirements for heaters and, where appropriate, the list of combinations recommended by the manufacturer;

(5) information relevant for disassembly, recycling and/or disposal at end-of-life;

(b) the technical documentation for the purposes of conformity assessment pursuant to Article 4 shall contain the following elements:

(1) the elements specified in point (a);

(2) for heat pump space heaters and heat pump combination heaters where the information relating to a specific model comprising a combination of indoor and outdoor units has been obtained by calculation on the basis of design and/or extrapolation from other combinations, the details of such calculations and/or extrapolations, and of any tests undertaken to verify the accuracy of the calculations, including details of the mathematical model for calculating the performance of such combinations and details of the measurements taken to verify this model;

(c) for the following heaters, the following information shall be durably marked on the product:

(1) if applicable, 'type B1 boiler' or 'type B1 combination boiler';

(2) for cogeneration space heaters, the electrical capacity in kW.

Table 1.

Information requirements for space heaters and combination heaters

GENERAL INFORMATION

Manufacturer:	
Model identifier:	
Product:	[fuel boiler/ electric boiler/ cogeneration heater/ electric heat pump/ thermally driven (TD) heat pump/ hybrid heater]
Heat pump heat source:	[air/ventilation exhaust/water/brine/direct exchange]
Fuel source:	[liquid fuel/gas/LPG]
Low/Medium temperature heat pump:	[LT/MT]

A. ELECTRIC & TD HEAT PUMP HEATERS/ HYBRID HEAT PUMP

							part load settings				
heat pump part load conditions	***Tj*** °C (x)	***pl*** (-) (x,xx)	***Ph*** kW (x,x)	***Pdh*** kW (x,x)	***COPd GUEd*** (-) (x,xx)	***Cdh*** (-) (x,xx)	***f*** Hz etc. (x)	***qwe/ qwc*** m³/h (x,x)/(x,x)	***Pcyc/ Tcyc kW/°C*** (x,x)/(x)	***elbu fuelbu*** kW (x,xx)	***COPbin GUEbin*** (-) (x,xx)
A	*-7*	*0,88*									
B	*2*	*0,54*									
C	*7*	*0,35*									
D	*12*	*0,15*									
E (*Tbiv, Tfb ,off*)											
F (*TOL, Thp,off)*											
Tdesignh	*-10*	*1,00*									
Prated,hp									***SCOPon / SGUEon***		

	ventilation heat pump only							
sound power & other, heat pump	***capa-city control*** [y/n]	***LWA indoor*** dB(A) (x)	***LWA outdoor*** dB(A) (x)	***LWA corrected*** (y/n)	***con-nected*** (y.n)	***outdoor air flow rate*** m³/h (x)	***vent. air flow rate*** m³/h (x)	***NOx (TD)_*** mg/kWh (x)

auxiliary electricity heat pump	***POFF*** kW (x,xxx)	***PTO*** kW (x,xxx)	***PSB*** kW (x,xxx)	***PCK*** kW (x,xxx)	***Qaux*** kW (x,x)	***SAEFon*** kW (x,x)	***QH*** kWh/a (x)	***QHE*** kWh/a (x)	***etas*** heat pump (%) (x)

B. FUEL & ELECTRIC BOILER/ COGENERATION HEATER/ BOILER IN HYBRID HEATER

boiler, cogeneration heater and hybrid (fuelbu)	***P4*** kW (x,x)	***P1*** kW (x,x)	***P0*** kW (x,x)	***eta4*** (%) (x)	***eta1*** (%) (x)	***eta0*** (%) (x)	***B1 boiler*** (y/n)	***NOx_(boiler)*** mg/kWh (x)

	cogeneration								
auxiliary electricity fuel boiler and sound	***PSB*** kW (x,xxx)	***elmax*** kW (x,xxx)	***elmin*** kW (x,xxx)	***Pstby*** kW (x,xxx)	***LWA indoor*** dB(A) (x)	***LWA outdoor*** dB(A) (x)	***Pel*** kW (x,x)	***Phs*** kW (x,x)	***etas*** boiler/cogen/ hybrid (%) (x)

C. STORAGE TANKS/ SOLAR THERMAL DEVICES									
Hot water storage tank					***Solar Thermal Devices***				
standing loss (S) in W	***Volume (V)*** in L	***V40*** in L	***Veq.*** in L	***Energy label*** A-G	***solar efficiency factor*** (avg. climate)		***Gross collector surface (Ag)*** in m²	***Gross Thermal Yield (GTY)*** in kWh/a	***Tank factor*** f_{tank}
					space heating in %	***water heating*** in %			
					[look-up table]*	*[look-up table**]*			

**=for chosen collector surface and given annual heating demand, in%*

***= for chosen collector surface and tapping profile, in %*

D. COMBINATION HEATERS

water heating efficiency	***Tapping profile*** [S..4XL]	***smart SCF*** (y/n)	***indirect PFHRD*** (y/n)	***Qfuel*** kWh/d (x,xx)	***Qelec*** kWh/d (x,xx)	η_{wh} (%) (x)

7. REQUIREMENTS RELATED TO SELF-MONITORING

Heaters shall satisfy the following monitoring requirements:

1) The heater shall determine, store and make visible, either on the heater and/or on remote devices[11] its instantaneous
   (a) energy input (electricity, gaseous or liquid fuels),
   (b) thermal energy output
   (c) energy efficiency (heat output/energy input),
   (d) number of on/off cycles (periods with no input) and
   (e) for combination heaters, whether the heater is used for space heating or sanitary water heating.

2) Instantaneous values will be displayed at an appropriate sample rate[12]. The values mentioned in point 1 will be stored with the following frequency:
   (a) cumulative data for at least the three previous years or the period since the start of the electricity supply contract, if that period is shorter. The data shall correspond to the intervals for which frequent billing information has been produced; and
   (b) detailed cumulative data according to the time of use for any day, week, month and year, which is made available to the final customer without undue delay via the internet or the meter interface, covering the period of at least the previous 24 months or the period since the start of the electricity supply contract, if that period is shorter.

   Furthermore, for the purpose of detailed analysis, hourly and quarter of an hour values will be stored for a period of 10 days (240 hours, 960 quarters of an hour.

3) For the assessment of hydronic heat energy output, a staged maximum permissible error (MPE) applies as indicated in the table below

Temperature difference range ΔΘ	**ΔΘ ≤ 5K**	**5<ΔΘ ≤ 10K**	**ΔΘ > 10K**
Tolerance ±	15%	10%	7,5%

[11] Dedicated displays, websites, smartphones

[12] E.g. 5 seconds

For the assessment of electricity, gas and fuel consumption or cogenerating electricity an MPE of ±5% applies.

Values may be derived from measurement of relevant technical parameters or calculation with default multipliers, as long as values are within the MPE.

4) In line with the General Data Protection Regulation (EU) 2016/679[13] the data will be available and accessible only to the final consumer, unless the final consumer shares and/or gives permission to access (part of) these data to third parties such as installers, manufacturers, public authorities.

5) The user manual of the heater shall provide:
   a) information on how the end-user or third parties can access the data;
   b) information on how the access of data by third-parties can be revoked by the end-user;
   c) if applicable, information about the remote collection and reporting of data by the manufacturer;
   d) options to consider for improving the energy efficiency;
   e) if applicable, information on the parts or components of the product, which for technical reasons cannot be considered when determining the information referred to in point 1) a), b) and c);

[13] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance)
OJ L 119, 4.5.2016, p. 1–88

ANNEX III

Measurements and calculations

1. 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 5.

2. GENERAL CONDITIONS FOR MEASUREMENTS AND CALCULATIONS

When providing the information in Annex II, table 1, the manufacturer will have provided most of the performance characteristics necessary to make the efficiency tests and calculations. P_{rated} for fuel boiler, electric boiler and cogeneration space heaters is the nominal heat output P_4 and for heat pump and hybrid space heaters it is $P_{rated,hp}$.

In addition, at least the following information needs to be provided for market surveillance:

a) For every part load condition, the complete manufacturer instructions, depending on the heat pump type, of the settings for electric compressor, burner or combustion engine in Hz, rpm, kW heat, or kW engine power, including relevant cycling information. Also instructions on control settings for source fan(s) or pump(s) speed as well as the circulator pump(s) speed on the sink side for testing per part load condition.

b) Manufacturer declaration of parameters required for the 'controls verification procedure' (CVP), as indicated in point 12 of this annex.

c) The method for establishing the seasonal energy efficiency (η_s) of hybrid space heaters, which consists of determining the heating capacity delivered by the electric heat pump and by the fuel boiler separately, similar to the bin method for an electric heat pump with a supplementary electric resistance heater that supplies the required capacity *elbu (Tj)*, in kW, on the basis of part loads per bin following the declared $P_{designh}$. Instead, the supplementary heater is a fuel boiler with seasonal energy efficiency in active mode η_{son} supplying the required capacity *fuelbu(Tj)*, converted to final energy equivalent by *CC*, and corrected for the auxiliary electricity use *F(2)* and standby heat loss *(F3)* of the boiler. The heating power contribution of the boiler *P(j)* per bin follows from the capacity of the heat pump per bin at the part load conditions which in turn depends on $P_{designh}$, $T_{hp,off}$ and $T_{fb,off.}$ $T_{hp,off}$ and $T_{fb,off}$ that are declared values, settings of the hybrid control and not subject to design conditions. The tests for the heat pump part of the hybrid are conducted with only the heat pump in operation and the boiler hydraulically connected, for part load conditions in Table 4 for outdoor temperature conditions greater or equal to $T_{hp,off}$.

3. SEASONAL SPACE HEATING ENERGY EFFICIENCY (η_s)

(a) for fuel boilers, electric boilers and cogeneration space heaters η_s is the seasonal space heating energy efficiency in active mode' (η_{son}) minus corrections for controls, auxiliary energy and standby heat loss *F(i),* with

$\eta_s = \eta_{son} - \Sigma F(i)$

(b) for electric heat pumps η_s is the seasonal coefficient of performance (*SCOP*) minus corrections for controls and auxiliary energy *F(i)* and the conversion coefficient, with

$\eta_s=(1/CC)\times SCOP - \Sigma F(i)$

where

SCOP is the ratio of the annual heat demand Q_H (in kWh/a) and the annual heating energy consumed Q_{HE} (in kWh/a)

$SCOP = Q_H/Q_{HE}$, with $Q_H = P_{designh} \times H_{HE}$

– where $P_{designh}$ is the declared design heat load in kW, where the manufacturer shall ensure that the product complies with the reference design conditions set out in Table 2.

H_{HE} is equivalent annual hours in on mode, set out in Table 3.

$Q_{HE} = Q_H / SCOP_{on} + Q_{aux}$

where Q_{aux} is the additional annual auxiliary electricity consumption, in kWh/a, calculated from the annual hours (Table 3) and measured power in thermostat off mode, standby mode, crankcase heater mode and off mode, with

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

Table 2

Reference design conditions for heat pump heaters, temperatures in dry bulb air temperature (wet bulb air temperature indicated in brackets)

Reference design temperature	$T_{designh}$	– 10 (– 11) °C
Bivalent temperature	T_{biv}	maximum + 2 °C
Operation Limit temperature	*TOL*	maximum -7 °C
For heat pump space heaters using ventilation exhaust air, 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

Note to CF: This ventilation heat pump equation ensures that the thermal loss by ventilation equals the design heating capacity, so that ventilation will not result in a net heat loss in design conditions. The value 0.01 is the product of the specific heat capacity of air (0.000344 kWh/m3*h/K) multiplied by the temperature difference in design conditions (temperature indoors is +20ºC; outdoors is -10ºC, is 30K difference): 0.000344*30 = 0.01 (rounded)

Table 3

Heat pump heater number of hours used (h/y)

Type of heat pump	on mode	thermostat-off mode	standby mode	off mode	crankcase heater mode
	H_{HE}	**H_{TO}**	**H_{SB}**	**H_{OFF}**	**H_{CK}**
Heating only	2066	178	0	3672	3850
Reversible	2066	178	0	0	178

(c) for thermally driven heat pumps η_s is the seasonal primary energy ratio (*SPER*) minus corrections for controls and auxiliary energy *F(i)* as with the electric heat pump and the conversion coefficient *CC,* with

$\eta_s = SPER - \Sigma F(i)$

with

$SPER = 1/\{1/SGUE + CC/SAEF\}$

where *SGUE* is the seasonal gas utilisation efficiency (only in on-mode by definition, so there is no '*on*' suffix)), *SAEF* is the seasonal auxiliary electricity factor with

$SAEF = Q_H/Q_{HE}$, with $Q_H = P_{designh} \times H_{HE}$ and $Q_{HE} = (Q_H/SAEF_{on}) + Q_{aux}$

4. SEASONAL SPACE HEATING ENERGY EFFICIENCY IN ACTIVE MODE (η_{son})

(a) for fuel boilers, η_{son} is weighted average of the useful efficiency η_4 at rated heat output P_4 and the useful efficiency η_1 at 30 % of the rated heat output P_1, where $\eta_{son} = 0{,}85 \times \eta_1 + 0{,}15 \times \eta_4$ expressed in %,

(b) for electric boilers, η_{son} is the useful efficiency η_4 at rated heat output P_4, where $\eta_{son} = \eta_4 = P_4/(EC \times CC)$ with *EC* is the electric power consumption to produce the useful heat P_4 , expressed in %;

(c) for cogeneration space heaters η_{son} is the rated heating power output P_4 in kW heat plus 2.65 times the rated electric power output P_{el} in kW electricity divided by the declared thermal input power in GCV of the oil/gas input P_{hs} in kWh), where $\eta_{son} = (P_4 + 2.65 \times P_{el}) / P_{hs}$, expressed in %;

(d) for electric heat pumps η_{son} corresponds to the seasonal coefficient of performance in active mode $SCOP_{on}$, which is derived from the measured $COP_{bin}(T_j)$ and capacity $P(T_j)$ at the part load test conditions for outdoor temperatures T_j('bins') A to F and at $P_{designh}$, as indicated in Table 4;

The average climate heating season bins with outdoor temperatures and number of hours per bin are given in Table 5. The part load per outdoor temperature $pl(T_j)$ can be calculated with the equation $pl(T_j) = (T_j - 16)/(T_{designh} - 16)$, where $T_{designh}$ is the design temperature pertaining to the design heat load $P_{designh}$.

Declared values for $COP_d(T_j)$ and $P_d(T_j)$ are the measured $COP_{bin}(T_j)$ and capacity $P(T_j)$ at the part load test conditions for outdoor temperatures T_j('bins') A to F and $P_{designh}$, as indicated in Table 4. The other values for $COP_{bin}(T_j)$ and $P(T_j)$ shall be determined through inter- and extrapolation of known values. If the heat pump capacity in a bin is too low for the heat demand, then a supplementary electric back-up resistance heater with the required capacity $elbu(T_j)$, in kW, fills in the lacking capacity. 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 (*Cd*, from test or default 0,9) and a capacity ratio (*CR*) has to be used to calculate the COP_{bin} for (T_j) with

$COP_{bin} = COP_d \times CR/(Cd \times CR + (1\text{-}Cd))$, where $CR = pl(Tj) \times P_{designh}/P_d$

The temperature regime for the indoor heat exchanger may change in case of cycling.

Once $COP_{bin}(T_j)$ and $elbu(T_j)$ have been assessed for each bin, the seasonal COP in on mode, $SCOP_{on}$,can be assessed with the number of hours h and heat demand P (in kW) per bin over the heating season as follows

$$SCOP_{on} = \frac{\sum_{j=1}^{n} h_j \times P_h\,(T_j)}{\sum_{j=1}^{n} h_j \left[\frac{P_h\,(T_j) - elbu\,(T_j)}{COP_{bin}(T_j)} + elbu(T_j)\right]}$$

(d) for thermally driven heat pumps, the η_{son} for thermally driven heat pumps is derived from two energy input values per bin: the gas utilisation factor *GUE* and the auxiliary electricity factor *AEF*. The value of AEF is early in the calculation corrected for primary energy, using the factor CC as shown in point 3 (c). For *GUE* there is no back-up, because the gas covers the full capacity. Apart from those issues, the calculation of *SGUE and* $SAEF_{on}$ is similar to that of $SCOP_{on}$.

$$SGUE = \frac{\sum_{j=1}^{n} h_j \times P_h\,(T_j)}{\sum_{j=1}^{n} h_j \left[\frac{P_h\,(T_j)}{GUE(T_j)}\right]}$$

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

5. CONTROL, AUXILIARY ENERGY AND STANDBY HEAT LOSS CORRECTIONS Σ *F(i)*

The control correction *F(1)* is the correction for the basic temperature control situation, subtracting 3%-percentage points from the seasonal space heating energy efficiency for all heaters;

(a) The auxiliary electricity correction *F(2)* is

- for fuel boilers

  $F(2) = CC \times (0{,}15 \times elmax + 0{,}85 \times elmin + 1{,}3 \times P_{SB}) / (0{,}15 \times P_4 + 0{,}85 \times P_1)$;

- for electric boilers $F(2) = 1{,}3 \times P_{SB} / (P_4 \times CC)$;

- for cogeneration space heaters $F(2) = CC \times elmax / P_4$;

- for electric water(brine)-source heat pumps *F(2)'* = 5%, accounting for ground-source pump electricity consumption.

(b) The standby heat loss correction *F(3)* is

- for fuel boilers $F(3) = 0{,}5 \times P_{stby} / P_4$,
- for electric boilers $F(3) = 0{,}5 \times P_{stby} / (P_4 \times CC)$ and
- for cogeneration space heaters $F(3) = 0$

Table 4

Part load test conditions for heat pump heaters

Test Con-dition	**Part Load Ratio in %**	**Outdoor heat exchanger**				**Indoor heat exchanger (emitter temperatures)**	
	Average climate (A)	Inlet dry (wet) bulb or liquid inlet/outlet temperature in °C				Temperature regime	outlet inlet/outlet temperature in °C
	A	***Outdoor air***	***Exhaust air***	***Water***	***Brine*** ****		***A***
A	88	−7(−8)	20(15)	10/*	5/*	LT	**/34
						MT	**/52
B	54	2(1)	20(15)	10/*	5/*	LT	**/30
						MT	**/42
C	35	7(6)	20(15)	10/*	5/*	LT	**/27
						MT	**/36
D	15	12(11)	20(15)	10/*	5/*	LT	**/24
						MT	**/30
E	(TOL - 16) / ($T_{designh}$ - 16)	TOL	20(15)	10/*	5/*	all	***/***
F	(T_{biv} - 16) / ($T_{designh}$ - 16)	T_{biv}	20(15)	10/*	5/*	all	***/***
$T_{designh}$	100	−10(−11)	20(15)	10/*	5/*	LT	**/35
						MT	**/55

*: With the flow rate as determined in the standard rating conditions (Annex IV) for units with a fixed flow rate or with a fixed water temperature difference 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.

**: With the flow rate as determined in the standard rating conditions (Annex IV) at 30/35 for LT application (respectively at 47/55 for MT application) for units with a fixed flow rate, and with a fixed water temperature difference of 5 K (respectively of 8 K) for units with a variable flow rate. For variable water flow, if the flow obtained from the 5 K (respectively 8 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.

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

**** = Also covers direct exchange (DX) ground heat pumps with bath temperature is 4 °C

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

Table 5

Average heating season of 4910 hours for heat pump and hybrid heaters with bins j for number of seasonal hours h(j) per rounded outdoor temperature (Tj)

j	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**
T(j)	–10	–9	–8	–7	–6	–5	–4	–3	–2	–1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
h(j)	1	25	23	24	27	68	91	89	165	173	240	280	320	357	356	303	330	326	348	335	315	215	169	151	105	74

6. WATER HEATING ENERGY EFFICIENCY FOR COMBINATION HEATERS

WATER HEATING TEST CONDITIONS

(a) For all combination heaters, the water heating measurements shall be carried out for the load profile with the largest reference energy (Q_{ref}) that can be supplied by the combination heater, or the load profile with a reference energy just below the largest that can be supplied, as set out in Table 8 taking into account the functional requirements in Annex II, section 1.4;

(b) for measurements under (a), the cold sanitary water inlet temperature is +10 °C and the ambient temperature is +20 °C if the combi heater is designated for use in a heated space. If the combi heater is designated for use in an unheated space then it shall be tested at the ambient temperature outdoors or, in case of a heat pump combi heater, of the source air temperature.

(c) The tests to determine energy efficiency and performance are subject to the following conditions:

- measurements shall be carried out using the load profiles set out in Table 8;
- measurements shall be carried out using a 24-hour measurement cycle as follows:
- 00:00 to 06:59: no water draw-off;
- from 07:00: water draw-offs according to the declared load profile;
- from end of last water draw-off until 24:00: no water draw-off;

(d) During the test for determining water heating efficiency no space heating shall occur, except when testing with passive flue heat recovery device (PFHRD) as declared by the manufacturer.

(e) When testing with passive flue heat recovery device (PFHRD), 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. 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).

(f) heat pump combi heaters shall be tested under the conditions set out in Table 6, whereby indoor air shall only be used as a rating condition for electric heat pumps if they are functional when supplied with an air temperature of 7°C or higher and have a rated electric input power of 300 Watt or smaller;

(g) heat pump combi heaters which use ventilation exhaust air as the heat source shall be tested under the conditions set out in Table 7, 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;

(h) combi heaters classified as off-peak combi heaters are 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 combi heaters are energised till the end of the step;

Table 6

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	Unheated indoor air	Exhaust air	Brine	Water
Temperature	+7 °C/+6 °C	+15 °C (maximum +12 °C)	+20 °C (+15 °C)	+5 °C(inlet)/ +2 °C (outlet)	+10 °C (inlet)/ +7 °C (outlet)

=for direct exchange heat pumps the bath temperature is +4 °C

Table 7

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 tapping 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

(i) Where the manufacturer deems it appropriate to declare the value of smart as being '1', measurements of the weekly electricity and/or fuel consumption with or without smart controls shall be carried out using a two-week measurement cycle as follows

- 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, and smart control disabled,
- days 6 and 7: no water draw-offs, and smart control disabled,
- days 8 to 12: repetition of the same sequence applied for days 1 to 5, and smart control enabled,
- days 13 and 14: no water draw-offs, and smart control enabled,

(j) The sound power level of heat pump combi heaters is to be measured at maximum heat output for water heating. Measurements shall be done outdoors for outdoor modules of split units and shall be done at inlet or exhaust duct opening in case of monobloc units, whichever produces the highest sound power level;

(k) Standing losses of hot water storage tanks shall be measured at ambient temperature of 20 °C and a storage temperature of 65 °C to be achieved and maintained during the test;

(l) For tests and test conditions not mentioned here, the transitional methods mentioned in Annex IV apply, as appropriate.

WATER HEATING ENERGY EFFICIENCY (η_{wh}) CALCULATION METHOD

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

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

where

- Q_{ref} is the total energy delivered by the load profile used, value from Table 9, 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, corrected also for electricity use of auxiliary components that are necessary for testing the load profile but not delivered with the product;
- 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.
- *SCF* smart control factor (*SCF*) means the water heating energy efficiency gain due to smart control;
- *smart* is the smart control coefficient, is equal to 0 without smart control or 1 with smart control;
- Q_{cor} is the ambient correction term, is equal to 0 for load profiles XXL to 4XL, and for load profiles S to XL with
  - conventional fuel heating $Q_{cor} = -0{,}23 \cdot (Q_{fuel} \cdot (1 - SCF \cdot smart) - Q_{ref}$
  - electric resistance heating $Q_{cor} = -0{,}23 \cdot (CC \cdot Q_{elec} \cdot (1 - SCF \cdot smart) - Q_{ref}$
  - heat pump water heating $Q_{cor} = -0{,}23 \cdot 24h \cdot P_{stdby}$
- F_{ctrl} is 1.00 if the combi heater can maintain a set water temperature independent of the water volume flow rate supplied by the combi heater and 0.95 if it cannot;

(b) For heat pump combi heaters, if during a tapping the T_{peak} of 55 °C in the load profiles of table 9 cannot be achieved by the heat pump, the average of the measured hot water temperature over the tapping shall not be lower than 50 ºC and the water heating efficiency η_{wh} shall be lowered by 4 percentage points;

(c) Where the manufacturer deems it appropriate to declare the value of ***smart*** as being '1', measurements of the weekly electricity and/or fuel consumption with or without smart controls shall be carried out using a two-week measurement cycle as indicated in section 3, sub (g) of this Annex.

The smart control factor (SCF) is calculated as follows

$$SCF = 1 - \frac{Q_{fuel,week,smart} + CC \times Q_{elec,week,smart}}{Q_{fuel,week} + CC \times Q_{elec,week}}$$

If SCF ≥ 0,07 and the product is 'smart compliant' the value of smart shall be 1. In all other cases the value of smart shall be 0.

The product shall be *'smart compliant'* if 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.

Note to CF: The testing and calculation of mixed water at 40°C (*V40*) is now described adequately in the appropriate standards in Annex IV and is shown here only to make transparent how the definition and calculation of the equivalent volume V_{eq} is arrived at.

Note for CF: Unrightfully, there is no SCF in regulations 813/2013. point g) is a literal citation from regulation 814/2013.

Table 8.

Water heating tapping (load) profiles

h	S					M				h	L				XL				XXL				h	3XL			
	Q_{tap}	Q_{tap}	f	T_m	T_p	Q_{tap}	f	T_m	T_p		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	kWh	l/min	°C	°C	kWh	l/ min	°C	°C		kWh	l/ min	°C	°C	kWh	l/ min	°C	°C	kWh	l/ min	°C	°C		kWh	l/ min	°C	°C
07:00	**0,015**	**0,105**	3	25		**0,105**	3	25		07:00	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25		07:00	**11,2**	48	40	
07:05	**0,015**					**1,4**	6	40		07:05	**1,4**	6	40										08:01	**5,04**	24	25	
07:15	**0,015**									07:15					**1,82**	6	40		**1,82**	6	40		09:00	**1,68**	24	25	
07:26	**0,015**									07:26					**0,105**	3	25		**0,105**	3	25		10:30	**0,84**	24	10	40
07:30	**0,015**	**0,105**	3	25		**0,105**	3	25		07:30	**0,105**	3	25										11:45	**1,68**	24	25	
08:01						**0,105**	3	25		07:45	**0,105**	3	25		**4,42**	10	10	40	**6,24**	16	10	40	12:45	**2,52**	32	10	55
08:15						**0,105**	3	25		08:01					**0,105**	3	25		**0,105**	3	25		15:30	**2,52**	24	25	
08:30		**0,105**	3	25		**0,105**	3	25		08:05	**3,605**	10	10	40									18:30	**3,36**	24	25	
08:45						**0,105**	3	25		08:15					**0,105**	3	25		**0,105**	3	25		20:30	**5,88**	32	10	55
09:00	**0,015**					**0,105**	3	25		08:25	**0,105**	3	25										21:30	**12,04**	48	40	
09:30	**0,015**	**0,105**	3	25		**0,105**	3	25		08:30	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25		*Qref*	**46,76**			
11:30	**0,015**	**0,105**	3	25		**0,105**	3	10	40	08:45	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
11:45	**0,015**	**0,105**	3	25		**0,105**	3	25		09:00	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
12:00	**0,015**					**0,105**	3	25		09:30	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
12:30	**0,015**									10:00					**0,105**	3	25		**0,105**	3	25						
12:45	**0,015**	**0,315**	4	10	55	**0,315**	4	10	55	10:30	**0,105**	3	10	40	**0,105**	3	10	40	**0,105**	3	10	40					
14:30	**0,015**					**0,105**	3	25		11:00					**0,105**	3	25		**0,105**	3	25						
15:00	**0,015**									11:30	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
15:30	**0,015**					**0,105**	3	25		11:45	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
16:00	**0,015**									12:45	**0,315**	4	10	55	**0,735**	4	10	55	**0,735**	4	10	55					
16:30						**0,105**	3	25		14:30	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
18:00		**0,105**	3	25		**0,105**	3	25		15:00					**0,105**	3	25		**0,105**	3	25						
18:15		**0,105**	3	40		**0,105**	3	40		15:30	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
18:30	**0,015**					**0,105**	3	40		16:00					**0,105**	3	25		**0,105**	3	25						
19:00	**0,015**					**0,105**	3	25		16:30	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
19:30	**0,015**									17:00					**0,105**	3	25		**0,105**	3	25						
20:00										18:00	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
20:30		**0,42**	4	10	55	**0,735**	4	10	55	18:15	**0,105**	3	40		**0,105**	3	40		**0,105**	3	40						
20:45										18:30	**0,105**	3	40		**0,105**	3	40		**0,105**	3	40						
21:00										19:00	**0,105**	3	25		**0,105**	3	25		**0,105**	3	25						
21:15	**0,015**					**0,105**	3	25		20:30	**0,735**	4	10	55	**0,735**	4	10	55	**0,735**	4	10	55					
21:30	**0,015**	**0,525**	5	45		**1,4**	6	40		20:46					**4,42**	10	10	40	**6,24**	16	10	40					
21:35	**0,015**									21:00	**3,605**	10	10	40													
21:45	**0,015**									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}	**0,345**	**2,100**				**5,845**				*Qref*	**11,655**				**19,07**				**24,53**								

h	4XL			
	Q_{tap}	f	T_m	T_p
	kWh	l/ min	°C	°C
07:00	**22,4**	96	40	
08:01	**10,08**	48	25	
09:00	**3,36**	48	25	
10:30	**1,68**	48	10	40
11:45	**3,36**	48	25	
12:45	**5,04**	64	10	55
15:30	**5,04**	48	25	
18:30	**6,72**	48	25	
20:30	**11,76**	64	10	55
21:30	**24,08**	96	40	
Qref	**93,52**			

Legend:
Qtap is kWh energy content
f is flow rate in litres/min
Tm minimum temperature °C
Tp peak temperature °C
cold water temperature 10 °C

specific heat capacity water: 1,163 Wh/kgK

7. WATER AND SPACE HEATING EFFICIENCY OF SOLAR DEVICES

(a) Solar device testing

The solar collector(s) and, if applicable, the solar hot water storage tank(s), shall be tested separately, except when the performance of the solar device depends on the integral assessment of solar collector in combination with solar storage tank (such as with thermosiphon / ICS solar devices).

The standards as referenced in Annex IV shall be applied. The weather data to be used for determining GTY shall relate to the location of Helsinki or Stockholm for the colder climate, Strasbourg or Würzburg for the average climate, and Athens for the warmer climate. The orientation for non-tracking collectors shall be South for all locations. The inclination for non-tracking collectors shall be 45º for the colder climate, 35º for the average climate and 25º for the warmer climate. For collectors designed to track the path of the sun, the optimal tracking parameters for the above locations, as declared by the manufacturer, shall be used.

When performing tests of solar collectors and/or subsequent calculations the volume of the solar storage tank shall be no less than 0,07 litre of water per kWh of GTY of the collector array.

(b) Solar device efficiency for water heating

(1) The GTY of a solar device the solar collector(s) of which were tested independent from the hot water storage tank shall be calculated using the calculation method referenced in ANNEX IV.

(2) The GTY of a solar device the solar collector(s) and hot water storage tank of which form an inseparable unit (e.g. ICS - Integrated Collector Storage) or have been tested together in order to determine the performance of the solar device (e.g. for thermosiphon systems), shall be the amount of heat delivered by the solar device Q_{sol} determined for the smallest load profile where the Q_{nonsol} for the 'warmer' climate is equal to or higher than the limit values shown in the table below.

Where:

a) The limit value for Q_{nonsol} is, in kWh/a:

	M	L	XL	XXL	3XL	4XL
Limit value	520	950	1510	1910	3570	7060

b) The non-solar heat required Q_{nonsol}, in kWh/a

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

c) The annual solar water heating demand $Q_{wh,sol}$, in kWh/a

$$Q_{wh,sol} = 0.6 * 366 * \left(Q_{ref} + 1.09\right)$$, in kWh/a;

d) The solar heat delivered Q_{sol} is established using standards referenced in Annex IV, in kWh/a;

(3) The solar device efficiency for water heating η is calculated as:

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

with:

– *GTY* is the climate-specific Gross Thermal Yield per year (kWh/yr) of the solar device where means the applicable climate condition.

– *Qwh,sol* see point 2)c) above, for the applicable load profile;

– Coefficient *a, b, c* and *d* as set out in the table below

Solar device water heating efficiency coefficients per climate	**a**	**b**	**c**	**d**
Average	-0.22	1.93	0.55	0.36

- $f_{profile}$ is tapping load profile specific coefficient as set out in the table below

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

– f_{tank}– correction factor for solar storage tank losses, specified for the energy efficiency class of the storage tank, taken from the product information sheet of the storage tank.

Storage tank energy label class	**A**	**B**	**C**	**D**	**E**
Storage tank correction factor f_{tank}	1.20	1.15	1.1	1.05	1

The solar device efficiency for water heating η as calculated for the combinations of *GTY* and Q_{ref} shall not be less than 100% and not exceed 240%, 450% and 500% for the Colder, Average and Warmer climate respectively.

(c) Solar device efficiency for space heating

The climate-specific solar device efficiency for space heating $\eta_{sol,sh}$ is calculated as:

$$\eta_{sol,sh} = \left(a * \left(\frac{GTY}{Q_H}\right)^2 + b * \left(\frac{GTY}{Q_H}\right) + c\right) * f_{tank}$$

with:

– *GTY* is the Gross Thermal Yield per year (kWh/yr) of the solar device where signifies the applicable climate condition (A, C or W).

– Q_H = annual space heating demand (kWh/yr), calculated as $P * H$ with H as set out in Table 5 per climate condition.[14]

– Climate-specific coefficients *a, b* and *c* as set out in the table below

[14] Note to CF. For fuel boilers follow EN 15502-1, i.e. the annual space heating demand is $P_{design} * H_{eH}$, which equals 800 h at nominal heat output P_N (=P_4), meaning that for space heating P_{design}= (800/2066 P_4)=0.387 P_4

Solar device space heating efficiency coefficients per climate	a	b	c
Average	0.00	0.50	1.00

where the calculated solar device efficiency for the various collector yield/demand ratios shall not be less than 100% and not exceed 300%.

8. PACKAGES OF SPACE HEATERS AND SOLAR DEVICES

This is the method to calculate the seasonal space heating energy efficiency of solar hybrid space heaters, as solar hybrid space heaters are part of packages of space heaters and solar devices.

The seasonal space heating energy efficiency of a hybrid of space heater(s) and solar devices $\eta_{s,pack}$ is calculated as the ratio of annual heat (equivalent) output $Q_{H,pack}$ and annual energy consumption $Q_{HE,pack}$ of the space heaters in the package, multiplied by the solar device space heating efficiency $\eta_{sol,sh}$ and tank factor f_{tank} as set out in point 7

$$\eta_{s,pack} = \eta_{sol,sh} \cdot \frac{Q_{H,pack}}{Q_{HE,pack}}$$

with

$$Q_{H,pack} = \sum_{k=1}^{n} Pdesign(k) \times H_{HE}(k) \text{ and}$$

$$Q_{HE,pack} = \sum_{k=1}^{n} \frac{Pdesign(k) \times H_{HE}(k)}{etas(k)}$$

where

Pdesign(k), *etas*(k) and *H (k)* refer to parameters set out in points 2 to 5, for space heaters listed in the table 9.

For a package where another space heater uses the electric power from the cogeneration heater, an adjusted calculation can be acceptable, provided that the calculation is reliable, accurate, reproducible and well documented.

Table 9

Package parameters

heater type	index	heat demand, Average climate (A)		seasonal space heating efficiency, Average climate (A)		active mode heating hours, Average climate (A)	
	k	***P(k)***	**A**	***etas(k)***	**A**	***H(k)***	**A**
		parameter	***kW***	**para-meter**	***%***	**para-meter**	***h/a***
Cogeneration heater	1	*Pdesign chp*		*etas chp*		*H chp*	4910
Heat pump electric heater	2	*Pdesign hp*		*etas hp*		*H other heater*	2066
Heat pump TD heater	3	*Pdesign hpt*		*etas hpt*			
Hybrid heater	4	*Pdesign hy*		*etas hy*			
Fuel boiler	5	*Pdesign fb*		*etas fb*			
Electric boiler or elbu	6	*Pdesign eb*		*etas eb*			

Solar-assisted space heating		
etasol,sh	%	
f_{tank}	-	

cogeneration heater		
P el	kW	

– *Pdesign(k)*, in kW heat output GCV, is

- *Pdesign(1)* of cogeneration heaters is *P4* + *Pel*·2,65, where *P4* is the nominal heat output and is the heat equivalent of the electricity output;
- *Pdesign(2),(3),(4)* of heat pump and hybrid heaters is the declared value within the boundary conditions as set out in points 2 to 5;
- *Pdesign(5)* of the fuel boiler is defined as *Pdesign*= (800/2066) · *P4*= 0,387 · *P4* for the Average climate. Proportional to the heating season hours, the values for Colder and Warmer climate are set at 0,46*P4* and 0,25*P4 ;*
- *Pdesign(6)* of the electric resistance boiler is defined as *P4;*

– *etas(k)* is the seasonal space heating efficiency as calculated in points 2 to 6;

– *H* is the equivalent hours in active mode for space heating is as given for heat pumps in Table 5. For cogeneration, which is assumed as a base load heater, the number of hours equals the length of the heating season in the three climate zones.

– The tank correction factor f_{tank} is specified for the energy efficiency class of the storage tank, taken from the product information sheet of the storage tank.

Storage tank energy label class	**A**	**B**	**C**	**D**	**E**	**F**
Storage tank correction factor f_{tank}	1.15	1.1	1.05	1	0.9	0.8

9. PACKAGES OF COMBINATION HEATERS AND SOLAR DEVICES

This is the method to calculate the seasonal space heating energy efficiency and water energy efficiency of solar hybrid combination heaters, as solar hybrid combination heaters are part of packages of combination heaters and solar devices:

(a) Space heating efficiency is to be assessed as in point 9;

(b) Water heating efficiency

The solar water heating efficiency of a combination heater package with a solar device, is calculated, for each climate condition specified, as:

$$\eta_{wh+so} = \eta_{sol,wh} * \eta_{wh}$$

with

– η_{wh+sol} is water heating efficiency of a package of combination heater with solar-devices, in %;

– $\eta_{sol,wh}$ is solar device efficiency for water heating, in %;

– η_{wh} is the water heating energy efficiency of the combi heater (without solar-assistence).

Note that 'combination heater' in this section can be a heater with water heating efficiency tested as indicated in point 6 of this Annex, or it can be a space heater converted to a combination heater with a water heating efficiency as calculated in section 10 of this Annex.

10. WATER HEATING EFFICIENCY OF A SPACE HEATER CONVERTED TO A COMBINATION HEATER

(a) if the product is equipped with a ***fuel boiler / hybrid / cogeneration / electric space heater*** and a separate (non-solar) storage tank and valve is added, the water heating efficiency is calculated as per below, using parameters from the fuel boiler and storage tank product information sheet:

$$\eta_{wh} = 0.95 * \frac{Q_{ref}}{(Q_{fuel} + CC * Q_{elec} + Q_{cor})}$$

where

$$Q_{fuel} = \left(Q_{ref} + \left(24 - \frac{Q_{ref}}{P_4}\right) * P_{stby}\right) * \left(\frac{Q_{ref}}{Q_{ref} + S * 0{,}024}\right) * (\frac{100}{\eta_4})$$

$$Q_{elec} = (24 - t_{on}) * elmin + t_{on} * elmax$$

$$t_{on} = \left(Q_{ref} + \left(24 - \frac{Q_{ref}}{P_4}\right) * P_{stby}\right) * \frac{1}{P_4}$$

where

– t is the time the boiler can be assumed to supply heat for water heating, calculated as indicated (in h/day)

The smart control factor is not used. Tank losses of hot water storage tanks are included in the calculation of solar device efficiency. Only hot water storage tank losses of other, additional, tanks shall be considered above.

(b) If the product is equipped with a heat pump space heater, the water heating efficiency is calculated as per below, using parameters from the heat pump space heater and storage tank product information sheet:

$$\eta_{wh} = 0.95 * f_{COP,wh} * \frac{COP_{rated} * f_{35°C}}{CC} * \frac{Q_{ref}}{Q_{ref} + S * 24}$$

Where:

- f_{COPwh} is a correction factor for the energy efficiency of the heat pump per heat source as set out in the table below

	Outdoor air or Direct exchange			Ventilation air	Brine	Water
Climate	***Colder***	***Average***	***Warmer***			
f_{COPwh}	0.919	0.840	1.059	0.888	0.931	0.914

- *COP* is the efficiency of the heat pump space heater, with source temperature conditions of part load condition C, set out in Table 6, and sanitary water inlet/outlet temperatures conditions stated in the table below

sanitary water temperature regime for heat pump space heaters used for water heating	For LT or MT heat pumps		For LT heat pumps
	other refrigerants	*CO2 as refrigerant*	
Sanitary water inlet/outlet temperatures	45/60ºC	10/60ºC	10/35ºC

- $f_{35ºC}$ is the correction for the COP assessed at 35ºC supply temperature, calculated as

  $f_{35ºC} = 0.5*COP$ (at 35ºC supply temperature) + 0.5

11. SOUND POWER

The sound power level of heat pump and hybrid 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 establishing the heat output for space heating at part load conditions B, as specified in Table 4.

The temperature conditions for sound power are given in Table 10.

Table 10: Temperature conditions for heat pump and hybrid sound power testing

Heat pump	Outdoor heat exchanger – inlet dry (wet) bulb temperature in °C	Indoor heat exchanger - inlet/outlet temperature in °C		The settings that affect sound power, such as compressor and fan speed or stage
		Temperature regime - MT	Temperature regime - LT	
air-to-water	7 (6) **	*/55	*/35	Part load condition B
exhaust air-to-water	20 (15)	*/55	*/35	Part load condition B
water-to-water	10 /*	*/55	*/35	Part load condition B
brine-to-water	5 /*	*/55	*/35	Part load condition B

direct exchange-to-water	4	*/55	*/35	Part load condition B

* with the fixed or variable water flowrate according to EN 14825 / in accordance with Annex IV
** A lower temperature down to 2 °C can be chosen if the unit can stabilize operations without defrost in the chosen conditions.

(b) Other heaters

For all heaters that are not heat pump heaters or hybrid heaters the sound power tests, part of the product information requirements, are to be conducted at rated heat output.

Note to CF: Part load condition B is at +2 °C outdoor temperature and at least at 54% part load (100% for fixed speed heat pumps) for MT heat pumps. It is not a replacement for local or national noise regulations for on-site situations, but it is believed to give a relevant comparison basis for heat pumps of the same type.

12. CONTROLS VERIFICATION PROCEDURE

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The 'controls verification procedure' (CVP) assesses whether the unit, using the controls that are expected to be used in real-life, is capable of achieving the compressor frequency/-ies that have been used to determine the performance in test condition D by subjecting the unit to dynamic (changing) conditions above, below and including test condition D.

(i) The CVP test condition at the test facility where unit is installed shall be set at part load condition D. The whole procedure applies to the unit's heating mode.

(ii) The inlet water temperature shall be set to a value specified by the manufacturer and at least 5K below the inlet water temperature for condition D.

(iii) The water flow and the pump speed shall be the same as during the performance test and as specified by the manufacturer. This flow and pump speed shall be kept constant during the test.

(iv) The system shall be started after the inlet water temperature is stable for at least 30 min.

(v) After verifying that the compressor frequency has reached a steady value that is higher than the

(vi) declared compressor frequency, the inlet water temperature shall start continuous increase with a predefined temperature pace specified by the manufacturer and within a range of >2,0 K/h

(vii) Compressor frequency shall decrease as the inlet water temperature goes up (heating).

(viii) The system shall reach the end temperature as specified by the manufacturer and within a range of -2K below and up to +1 K above the outlet water temperature specified for part load condition D;

(ix) Before the unit turns off (thermal-off), the compressor frequency recorded shall be verified for at least 20 seconds with the declared value from the part load testing of the unit for part load condition D.

(x) The unit is considered to have passed the Controls Verification Procedure if the declared frequency has occurred for at least 20 seconds continuously during the above procedure. If this criterion is not met, the unit has failed the Controls Verification Procedure.

Note to CF: Permissible temperature deviations and frequency deviations will apply to the pass test, but are currently being discussed in the standardisation working groups dealing with the CVP.

ANNEX IV

Transitional Methods

Table 11

References and qualifying notes for central hydronic space heaters and combination heaters

(The source of all references is CEN unless otherwise indicated)

Parameter	Reference/ Title	Notes and short description
Gas-fired heating boilers		
η, P, design types, P_{stby}, P_{ign}	***FprEN 15502-1:2020 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 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 %. At the nominal boiler heat input (or minmax average for range rated boilers) the water flow rate through the boiler is adjusted so as 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 low 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 boilers is to be applied*
Standby heat loss P_{stby}	§ 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}.

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)	
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 distinguishes (prematurely) correction factors to the Ecodesign limits for G30 and G31 test gases. This is now added in Annex II.
Remote control	§ 5.7.9 Instructions for safe remote control operations	on data exchange, see clause 7.8 of EN 13611:2019

Liquid fuel fired heating boilers

General test conditions	***EN 304:2017; Heating boilers - Test code for heating boilers for atomizing oil burners; Section 6 ('Tests')***	***Notes***
Useful nominal heat output P_N (= P_4) and useful efficiency η_u (=η_4) at 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 low 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}	§ 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), F(3) and F(4)	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.	

Electric boiler space heaters and electric boiler combination heaters

Seasonal space heating energy efficiency ηs of electric boiler space heaters and electric boiler combination heaters	European Commission: See Annex III	

Cogeneration space heaters

General test conditions	***EN 50465:2015. 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 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 nominal 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 with a factor 2.65 to indicate the energy savings.
Standby heat loss P_{stby} 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 L_{WA}	§7.17 refers to ***EN 15036 - 1:2006 Heating boilers - Test regulations for airborne noise emissions from heat generators***	
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.

Electric heat pump space heaters

General test conditions	***EN 14511-2: 2018 … heat pumps, with electrically driven compressors, for space heating … – Testing and rating at part load conditions and calculation of seasonal performance;***	***Notes***
Standard rating conditions	Water & Brine. Tables 7 (LT) & 9 (MT). Outdoor & Exhaust air. Tables 12 (LT) and 14(MT)	
	prEN 14825-2020 … heat pumps, with electrically driven compressors, for space heating … – Testing and rating at part load conditions and calculation of seasonal performance;	
Reference design conditions $P_{designh}$, 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 W, A, C	
Part load test conditions	§5.7.2 Air-to-water(brine) units Tables 5,6,7. §6.5 DX-to-water(brine) and water(brine)-to-water(brine) units. Tables 12 and 14. The tables give test conditions A to F relating to source (bin) temperatures and –variable or fixed—sink temperature regimes.	All heating seasons (A, W,C) and temperature regimes are covered. For Ecodesign only Average climate (A) and LT and MT temperature regimes are relevant. Note that for brine ground source heat pumps the new regulation uses higher source temperatures (5/2 instead of 0/-3 °C)
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 equivalent active mode hours. §7.5. With hours (and measured power) for auxiliary and off modes the formula for $SCOP_{on}$ is complete	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 H_{CK} are given in Annex A2. and A3.

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 inter/ 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 demand the electric back-up (*elbu*) heat is required. In the end, the COP values per bin are summed, weighted for the bin hours per bin.	annex A.1.3 Heating: Table A.2 with look-up for bin hours per outdoor temperature, needed for calculating $SCOP_{on}$
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). *P* and *COP* values for missing bins are inter/extrapolated, similar as for *elbu.*	$T_{fb,off}$ (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. $T_{hp,off}$ (heat pump off) corresponds to *TOL*, i.e. the lowest bin temperature where the heat pump can still have a contribution to supply the heat demand . Note that the active mode efficiency of the fuel boiler is η_{son} (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 inter/extrapolated.	$T_{fb,off}$ (T_{biv}) and $T_{hp,off}$ (*TOL*) are also rated test conditions. Note: As an extra demand, independent of the method, the heat pump shall have a contribution of not less than 25% of the annual heat demand.
Cycling parameters Pcyc, Tcyc, Cd, settings for CR	§11.5 and §11.6	
Compensation method	§11.6.3 Compensation method (also annex K). Instead of the current practice where the manufacturer declares the compressor (and flow rate) speed settings, the compensation	It was found by German BAM that this had an impact of 10% on the heat pump SCOP values. At the moment there are Round Robin Tests at 27 European laboratories to check reproducibility and otherwise

	method allows the controls of the unit, assisted with manual calibration of the laboratory, to reach the rated test conditions.	feasibility of using this compensation method.
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	

Gas-fired sorption appliances for heating (Thermally Driven heat pumps)

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. $SPER = 1/\{Prim_{gas}/SGUE + Prim_{elec}/SAEF\}$ GUE=Gas 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 $SGUE_{on}$	§5.4 Table 29 is the bin-table to facilitate calculation of *Seasonal GUE* (*SGUE*)	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 shall 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 shall 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

<u>Gas-fired endothermic engine driven heat pumps (Thermally Driven heat pumps)</u>

General test conditions	***prEN 12309-5:2017 Gas-fired sorption appliances for heating and/or cooling with a net heat input not exceeding 70kW – Calculation of Seasonal Performances***	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
	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/{$Prim_{gas}$/$SGUE$ +$Prim_{elec}$/SAEF} GUE=Gas 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 $SGUE_{on}$	§7.4 Table 29 is the bin-table to facilitate calculation of *Seasonal GUE* (*SGUE*)	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

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 **atomizing 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.

Solar devices and packages of solar device and heater

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, similar as 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 shall be climate specific (Helsinki/Stockholm, Strasbourg/Würzburg, and/or Athens) and take into account orientation and inclination as indicated in Annex III. 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}	Annex III, point 7	Q = Q *366*0.6
Correction factor $f_{profile}$	Annex III, point 7	
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}		

Note to CF: Annex V uses this revised text of 2016/2282. Table 11 uses 'parameters', not 'measured parameters'. Also uses some changes from the omnibus regulation

Accuracy of monitoring

Gas metering accuracy	EN 14236:2018	Ultrasonic domestic gas meters
	EN 1359:2017	Diaphragm gas meters
Electricity metering accuracy-acceptance inspection	EN 62058-11:2010	Acceptance inspection – Part 11: General acceptance inspection methods
	EN 62058-21:2010	Part 21: Particular requirements for electromechanical meters
	EN 62058-31:2010	Part 31: Particular requirements for static meters
	EN 62058-32-1:2012	Part 32-1: Durability – Testing … by applying elevated temperatures
Heat metering	EN1434-1:2015	Part 1: General requirements

ANNEX V

Product compliance verification by market surveillance authorities

The verification tolerances defined in this Annex relate only to the verification by Member State authorities of the declared values and shall not be used by the manufacturer, importer or authorised representative as an allowed tolerance to establish the values in the technical documentation or in interpreting these values with a view to achieving compliance or to communicate better performance by any means.

As part of verifying the compliance of a product model with the requirements laid down in this Regulation pursuant to Article 3(2) of Directive 2009/125/EC, for the requirements referred to in this Annex, the authorities of the Member States shall apply the following procedure:

(1) The Member State authorities shall verify one single unit of the model.

(2) The model shall be considered to comply with the applicable requirements if:

(a) the values given in the technical documentation pursuant to point 2 of Annex IV to Directive 2009/125/EC (declared values), and, where applicable, the values used to calculate these values, are not more favourable for the manufacturer or importer than the results of the corresponding measurements carried out pursuant to paragraph (g) thereof; and

(b) the declared values meet any requirements laid down in this Regulation, and any required product information published by the manufacturer or importer does not contain values that are more favourable for the manufacturer or importer than the declared values; and

(c) 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 as given in Table 8.

(3) If the results referred to in point 2(a) or (b) are not achieved, the model and all other equivalent models shall be considered not to comply with this Regulation.

(4) If the result referred to in point 2(c) 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.

(5) The model shall be considered to comply with the applicable requirements if, for these three units, the arithmetical mean of the determined values complies with the respective verification tolerances given in Table 8.

(6) If the result referred to in point 5 is not achieved, the model and all other equivalent models shall be considered not to comply with this Regulation.

(7) 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 according to points 3 and 6.

The Member State authorities shall use the measurement and calculation methods set out in Annex III.

The Member State authorities shall only apply the verification tolerances that are set out in Table 13 and shall only use the procedure described in points 1 to 7 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, shall be applied.

Table 13

Verification tolerances

Parameters	**Verification tolerances**
Seasonal space-heating energy efficiency of fuel and electric boilers, η_s	The determined value shall not be lower than the declared value by more than 4 %.
Seasonal space-heating energy efficiency of cogeneration and heat pump space heaters, η_s	The determined value shall not be lower than the declared value by more than 8 %.
Water-heating energy efficiency, η_{wh}	The determined value shall not be lower than the declared value by more than 8 %.
Sound power level, L_{WA}	The determined value shall not exceed the declared value by more than 2 dB(A).
Emissions of nitrogen oxides	The determined value shall not exceed the declared value by more than 20 %.
Accuracy of self-monitoring	The maximum permissible error for fuel/electricity consumption and heat/electricity delivered shall be not more than what is indicated in Annex II. Section 7.sub 3
Turndown ratio of gas-/oil boiler	The maximum permissible error for the declared turndown ratio of gas/oil boilers is ±5% of rated heat output for space heating
Heating capacity of heat pump, measured on the liquid side	The maximum permissible error is (2+3/part load ratio) %.
COP of heat pump	The maximum permissible error is (3+3/part load ratio) %.
Electric power input for off, thermostat-off, standby and crankcase heater modes of heat pump	The maximum permissible error is — 0,3 W up to 10 W; — 3 % for powers greater than 10 W

ANNEX VI

Indicative benchmarks

At the time of entry into force of this Regulation, the best available technology on the market for heaters in terms of seasonal space heating energy efficiency, water heating energy efficiency, sound power level and emissions of nitrogen oxides was identified as follows:

1. Benchmark for seasonal space heating energy efficiency, at CC 1,9 and manufacturer declared part load settings for heat pump and hybrid space heaters.

Space heater type	seasonal space heating energy efficiency
Gas-fired condensing fuel boiler, MT	95%
B1 Fuel boiler ≤10 kW & Fuel combi boiler ≤30 kW, MT	81%
Electric (combi) boiler, MT	51%
Cogeneration space heater FC (Fuel Cell), MT	180%
Cogeneration space heater ICE (Internal Combustion Engine), MT	130%
Cogeneration space heater ECE (External Combustion Engine), MT	110%
Electric heat pump, MT water source*	305%
Electric heat pump, MT ground source	260%
Electric heat pump, MT air source	200%
Electric heat pump, LT water source*	420%
Electric heat pump, LT ground source	360%
Electric heat pump, LT air source	265%
Thermally Driven (TD) heat pump, all types, LT/MT	150%
Hybrid heat pump, MT	165%

**=excludes energy needed for water-source systems like low temperature (district) heat networks, ATES (aquifer thermal energy storage) or other.*

Note to CF: We propose not to consider water source heat pump efficiencies as a yardstick for class 'A' energy labelling because they are often part of another system (district heating, ATES, waste heat) that supplies the high source temperatures that make these heat pumps so efficient. The energy of this 'other system' is not taken into account.

2. Benchmarks for water heating energy efficiency, at *CC* 1,9, of combination heaters:

Combination heater type	**Declared tapping profiles**				
	S	**M**	**L**	**XL**	**XXL** (3XL-4XL)
electric combination boiler	47%	47%	50%	51%	51%
fuel instantaneous combination boiler	-	80%	85%	90%	94%
fuel storage type combination boiler	-	75%	80%	86%	90%
electric heat pump combination heater	-	110%	182%	177%	160%
thermally driven heat pump combination	-	100%	110%	120%	120%
B1 fuel combination boiler	-	65%	70%	75%	80%
cogeneration combination heater	-	80%	85%	125%	85%

Note to CF: Especially for water heating not all benchmarks could be found in catalogues and needed to be assessed from the EPREL database.

3. Benchmarks for emissions of nitrogen oxides, expressed in nitrogen dioxide:

(a) of boiler space heaters and boiler combination heaters using gaseous fuels: 14 mg/kWh fuel input in terms of GCV;
(b) of boiler space heaters and boiler combination heaters using liquid fuels: 50 mg/kWh fuel input in terms of GCV.

The benchmarks specified in points 1 to 3 do not necessarily imply that a combination of these values is achievable for a single heater.

Lowest turndown ratios for efficient gas-fired boilers: 6% at 30 kW, 7% at 23.5 kW, 10% at 18 kW rated heat output. For oil-fired boilers the turndown ratios tend to be a factor 1.4-1.5 higher than those for gas-fired boilers at the same rated heat output.

Note to CF: The current sound power declarations for heat pumps at test point C cannot be compared to the current sound power values at +7 °C and settings for point B. But there are no new benchmark values available.