***Disclaimer***

*This is a working document supporting the discussion of the revision of REGULATION (EU) 811/2013 laying down energy labelling 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 DELEGATED REGULATION (EU) No [XXX/XXXX] of [XX/XX/XXXX]**

**implementing Regulation (EU) 2017/1369 of the European Parliament and of the Council with regard to energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device, repealing Commission Regulation (EU) No 811/2013**

(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

[whereas section]

*Article 1*

**Subject matter and scope**

1. This Regulation establishes requirements for the energy labelling of, and the provision of supplementary product information on, hydronic central space heaters and combination heaters with a rated heat output ≤ 70 kW, 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 capturing ambient or waste heat for heat generation, 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 solar thermal devices as well as a fuel boiler for back-up with a hybrid master controller managing the operation of the heat generators.

as well as of packages of these heaters with temperature controls and solar devices.

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 Annexes 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;

*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 water-based 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

(3) 'combination heater' 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 set out in Annex VIII;
(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 heater’ means a heater using a thermodynamic cycle capturing ambient and/or waste heat from an air source, water source or ground source 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) ‘hybrid heat pump’ means is an encased assembly or assemblies designed as a unit consisting of an electric heat pump and a fuel boiler as heat generators, as well as a hybrid master controller providing an optimised operation of the heat generators for space heating and possibly water heating;
(12) ‘package of heater, temperature control and solar device’ means a package offered to the end-user containing one or more space heaters combined with one or more temperature controls and/or one or more solar devices;
(13) ‘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;
(14) ‘heat generator’ means the part of a heater that generates the heat;
(15) ‘heater housing’ means the part of a heater designed to have a heat generator fitted;
(16) ‘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;
(17) ‘biomass fuel’ means a gaseous or liquid fuel produced from biomass;
(18) ‘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’).
(19) ‘reversible heat pump heater’ means a heat pump heater capable of both cooling and heating;
(20) ‘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);
(21) ‘shower water heat recovery device’ means that part of the water heating package where heat of spent shower water directed to sewage is transferred instantaneously to incoming cold water supplying the water heater and/or shower tap;
(22) ‘seasonal space heating energy efficiency’ (ηs 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 %;
(23) ‘water heating energy efficiency’ (ηwh 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 %;
(24) ‘sound power level’ (LWA ) means the A-weighted sound power level, indoors and/or outdoors, expressed in dB, assessed as set out in Annex VIII, section 6;
(25) ‘conversion coefficient’ (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 Council6. The value of the conversion coefficient is CC = 1,9.7

[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

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

*Article 3*

**Obligations of suppliers**

From [Date of application], suppliers placing on the market and/or putting into service

(1) space heaters, including those integrated in packages of space heater, temperature control and solar device, conforming to the *etas* classes set out in point 1 of Annex II;
(2) combination heaters, including those integrated in packages of combination heater, temperature control and solar device, conforming to the *etas* and *etawh* classes set out in points 1 and 2 of Annex II;
(3) temperature controls;
(4) solar devices;
(5) packages of space heater, temperature control and solar device, conforming to the *etas* classes set out in point 1 of Annex II;
(6) packages of combination heater, temperature control and solar device, conforming to the *etas* and *etawh* classes set out in points 1 and 2 of Annex II;

shall ensure that for these products, as appropriate:

(a) a printed label complying with the format and content is provided, except for temperature controls and solar devices, as set out in the designated section 1 to 5 of Annex III;
(b) the values for the parameters in the product information sheet, as set out in Annex IV, are entered into the product database;
(c) the product information sheet is available in printed form upon request.
(d) the technical documentation, as set out in the designated section of Annex V, is provided on request to the authorities of the Member States and to the Commission;
(e) any advertisement relating to a specific space heater model and containing energy-related or price information includes a reference to the seasonal space heating energy efficiency class under average climate conditions and, if appropriate, the water heating energy efficiency class under average climate conditions for that model except for temperature controls and solar devices;
(f) any technical promotional material concerning a specific model and describing its specific technical parameters includes a reference to the seasonal space heating energy efficiency class and, if appropriate, the water heating energy efficiency class under average climate conditions for that model except for temperature controls and solar devices;
(g) an electronic label in the format and content, as set out in the designated section of Annex VII, is made available to dealers, except for temperature controls and solar devices;
(h) an electronic product information sheet, as set out in the designated section of Annex IV, is made available to dealers;

whereby

for heaters with more than one packaging, the printed label is provided at least in the packaging of the heat generator and for space heaters intended for use in packages of space heater, temperature control and solar device, a second label for the appropriate package is to be provided.

Heaters and package of heaters, temperature controls and solar devices, whose first unit is placed on the market or put into service on or after [4 years after Date of application] shall use labels defined in Annex III with changes indicated in section 6.

*Article 4*

**Obligations of dealers**

Dealers shall ensure for each

(1) space heater;
(2) combination heater;
(3) package of space heater, temperature control and solar device;
(4) package of combination heater, temperature control, hot water storage tank and solar device;

that

(i) at the point of sale, it bears the label provided by suppliers in accordance with Article 3, on the outside of the front of the appliance, in such a way as to be clearly visible;
(j) when it is offered for sale, hire or hire-purchase, where the end-user cannot be expected to see the product displayed, it is marketed with the information provided by the suppliers in accordance with Annex VI;
(k) any visual advertisement relating to a specific space heater model and containing energy related or price information includes a reference to the seasonal space heating energy efficiency class under average climate conditions for that model;
(l) any technical promotional material concerning a specific space heater model and describing its specific technical parameters includes a reference to the seasonal space heating energy efficiency class under average climate conditions for that model;
(m) where the product is a package any offer for a specific model includes the seasonal space heating energy efficiency and the seasonal space heating energy efficiency class as well as, if the package contains a combination heater, the water heating energy efficiency and the water heating energy efficiency class for that package under average, colder or warmer climate conditions, as applicable, by displaying with the package the label set out in point 4 of Annex III and providing the product information sheet set out in point 6 of Annex IV, duly filled in according to the characteristics of that package.

*Article 5*

**Measurement and calculation methods**

The information to be provided pursuant to Articles 3 and 4 shall be obtained by reliable, accurate and reproducible measurement and calculation methods which take into account the recognised state-of-the-art measurement and calculation methods, as set out in Annex VIII, following transitional provisions as indicated in Annex IX as appropriate.

*Article 6*

**Verification procedure for market surveillance purposes**

Member States shall apply the procedure set out in Annex X when assessing the conformity of the declared seasonal space heating energy efficiency class, water heating energy efficiency class, seasonal space heating energy efficiency, water heating energy efficiency and sound power level of heaters.

*Article 7*

**Review**

The Commission shall review this Regulation in the light of technological progress no later than five years after its entry into force. The review shall in particular assess

– significant changes in sales and market shares, and energy aspects of the different types of space and combination heaters, temperature controls and solar devices;

– the energy classes of space heaters, combination heaters, packages of space or combination heaters, temperature controls and solar devices and the design of the energy label;

– the possibility to address circular economy aspects.

*Article 8*

**Repeal**

Commission Delegated Regulation (EU) No 811/2013 shall be repealed.

*Article 9*

**Transitional measures**

Until one day before [date of application], the product fiche required under Article 3, point (b), of Commission Regulation (EU) 811/2013 may be made available through the product database instead of being provided in printed form with the product. However, where the dealer so requests, the supplier shall ensure that the product fiche is made available in printed form.

*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. However, Article 3 paragraph 2, points (a),(b) and (c), shall apply from four months before date of application (1 May 2025).

Provisions indicated to apply four years after date of application shall apply as from 1 September 2029.

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 X**

For the purposes of Annexes II to X 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) 'climate conditions' means the temperature conditions during a heating season as a proxy for the 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) 'average climate'(A), 'colder climate'(C), 'warmer climate'(W) are the climate conditions characteristic for the cities of Strasbourg, Helsinki and Athens, respectively (for solar devices Würzburg and Stockholm are allowed as alternatives to Strasbourg and Helsinki respectively);

(7) '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);

(8) '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);

(9) '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;

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

**Definitions related to fuel boilers and cogeneration heaters**

(11) ‘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;

(12) ‘B1 combination boiler’ means a B1 boiler designed to operate as a combination heater;

(13) ‘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;

(14) ‘useful efficiency’ ($\eta$) 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;

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

(16) ‘nominal heat input’ ($Phs$) 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.

(17) ‘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 VIII, section 4, sub (a) to (c).

(18) 'design load' ($P_{design}$) of a fuel boiler, expressed in kW, is the rated heat output $P_4$ multiplied by 800 and divided by 2066, as used in Annex VIII, section 9;

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

(20) ‘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;

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

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

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

(24) ‘electrical efficiency’ ($\eta_{el}$) 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 $CC$;

(25) ‘seasonal space heating energy efficiency’ ($\eta_s$ or etas) 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 VIII, section 3;

(26) ‘seasonal space heating energy efficiency in active mode’ ($\eta_{son}$ 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 VIII, section 4;

(27) ‘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 VIII, section 5;

(28) ‘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 VIII, section 5;

(29) ‘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 VIII, section 5, sub (a) ;

(30) ‘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;

(31) ‘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 VIII, section 5, sub (a);

(32) ‘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 VIII, section 5, sub (a);

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

**Definitions related to heat pump and hybrid heaters**

(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 VIII, 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’ ($P_{rated,\ hp}$) 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 VIII, section 3, sub (b);

(42) ‘annual equivalent active mode hours’ ($H_{eH}$ ) means the assumed annual number of 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 VIII, 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 VIII, 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 VIII, Table 5 for the reference ‘Average’, Warm’, ‘Cold’ climates;

(45) ‘bin’ (*bin j* ) means a climate-specific combination of an outdoor temperature and a number of bin hours, as set out in Annex VIII, Table 5;

(46) ‘outdoor temperature’ ($T_j$ ) means the dry bulb outdoor air temperature, 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 minus 16 °C divided by the reference design temperature 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 VIII, 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 VIII, 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, 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 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, 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, 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 divided $Ph(T_j)$ by the declared heating capacity $Pdh(T_j)$ of the unit at the same temperature conditions;

(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;

(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 VIII, 3(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 VIII, 3(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 VIII, 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 VIII, section 4, sub (d);

(71) 'fuel supplementary heater capacity' (*fuelbu*($T_j$)) of a hybrid heater means the heat output of a supplementary 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 VIII, 2(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 [8];

(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;

[8] 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 ($H_{eH}$), 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 VIII, 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 in non-active mode, as set out in Annex VIII, 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 its declared capacity for heating at an indoor heat exchanger outlet temperature of 35 °C for fixed capacity units or at a specific water(brine) outlet temperature per part load condition as indicated in the rows marked 'LT', as set out in Annex VIII, Table 4;

(86) ‘medium temperature application’ means an application where the heat pump heater delivers its declared capacity for heating at an indoor heat exchanger outlet temperature of 55 °C for fixed capacity units or at a specific water(brine) outlet temperature per part load condition as indicated in the rows marked 'MT', as set out in Annex VIII, Table 4;

(87) ‘high temperature application’ means an application where the heat pump heater delivers its declared capacity for heating at an indoor heat exchanger outlet temperature of 65 °C for fixed capacity units or at a specific water(brine) outlet temperature per part load condition as indicated in the rows marked 'HT', as set out in Annex VIII, Table 4;

(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 VIII, Table 4, that can be used when assessing the space heating efficiency;

(89) ‘sound power correct’ ($LWA_{correct}$) means a possible correction applied to the outcome of the sound power level outcome of an air source heat pump, as set out in Annex VIII, section 13.

(90) '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 VIII, section 2, sub (b);

(91) 'switch temperature heat pump off' ($T_{h\,p,off}$) 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 VIII, section 2, sub (b);

**Definitions related to water heating in combination heaters**

(92) 'load profile' means a declared sequence of water draw-offs, as specified in Annex VIII, Table 9; each combination heater meets at least one load profile, as set out in Annex VIII, section 6;

(93) '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 VIII, Table 8;

(94) '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 VIII, Table 8;

(95) '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 VIII, Table 8;

(96) '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 VIII, Table 8;

(97) '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;

(98) 'peak temperature' ($T_p$ ) means the minimum water temperature, expressed in degrees Celsius, to be achieved during water draw-off, as specified in Annex VIII, Table 8;

(99) '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 VIII, Table 8;

(100) '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;

(101) 'declared load profile' means the tapping load profile applied for conformity assessment;

(102) '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;

(103) '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.

(104) '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;

(105) '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;

(106) 'ambient correction term' ($Q_{cor}$) means a term which takes into account the fact that the place where the water heater is installed is not an isothermal place, expressed in kWh;

(107) ‘smart control compliance’ (*smart*) means the measure of whether a water heater equipped with smart controls fulfils the criterion set out in Annex VIII, section 6, sub (g);

(108) ‘smart control factor’ (*SCF*) means the water heating energy efficiency gain due to smart control under the conditions set out in Annex VIII, section 6, sub (g);

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

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

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

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

(113) ‘Passive Flue Heat Recovery Device’ (*PFHRD*) device integrated in the appliance or supplied with the appliance as an option approved by the appliance manufacturer, to transmit waste heat from the combustion products to hot water, as set out in Annex VIII;

(114) 'direct PFHRD contribution' energy contribution by the *PFHRD* to sanitary hot water production recovered from flue gas energy during hot water production, as set out in Annex VIII, point 6(f);

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

(116) ‘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 VIII, Table 7, that can be used when assessing the water heating efficiency;

(117) ‘package correction factor for the heat pump water heating efficiency per heat source’ ( $f_{COPwh}$ ) as set out Annex VIII, section 11, sub (b).

**Definitions related to solar devices**

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

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

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

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

(122) ‘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 VIII, section 7, sub ( c) and section 9;

(123) ‘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 VIII, sections 9 and 10;

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

(125) 'non solar heat required' $Q_{nonsol}$ 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 water heater, in kWh/a;

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

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

(128) ‘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;

**Definitions related to hot water storage tanks**

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

**Definitions related to shower water heat recovery devices**

(130) ‘shower water heat recovery device factor’ ($f_{SWHRD}$) means a factor representing the water heating energy efficiency gains of a combination heater package comprising a shower water heat recovery device;

(131) 'shower water heat recovery efficiency' (ηSWHRD) means the thermal efficiency of the shower water heat recovery device calculated as the ratio of the heat recovered by the device divided by the heat supplied to the device;

*ANNEX II*

**Energy efficiency classes**

1. SEASONAL SPACE HEATING ENERGY EFFICIENCY CLASSES

The seasonal space heating energy efficiency $\eta s$ in %,

- at average climate conditions and
- at the applicable Conversion Coefficient CC 1,9,
- distinguishing between declared Medium Temperature (MT) and Low Temperature (LT) regime for heat pumps while using MT as a default for other products in scope,

shall determine the energy labelling space heating efficiency at the lower class limits (except G class) as set out in the table below

| Seasonal space heating energy efficiency class | Seasonal space heating energy efficiency class **MT regime** | Seasonal space heating energy efficiency class **LT regime** |
|---|---|---|
| A | 260 | 360 |
| B | 200 | 250 |
| C | 165 | 205 |
| D | 145 | 175 |
| E | 115 | 150 |
| F | 90 | 115 |
| G | <90 | <115 |

2. WATER HEATING ENERGY EFFICIENCY CLASSES

The water heating energy efficiency classes of combination heaters shall be determined on the basis of class limits as set out in the table below for the various declared tapping profiles.

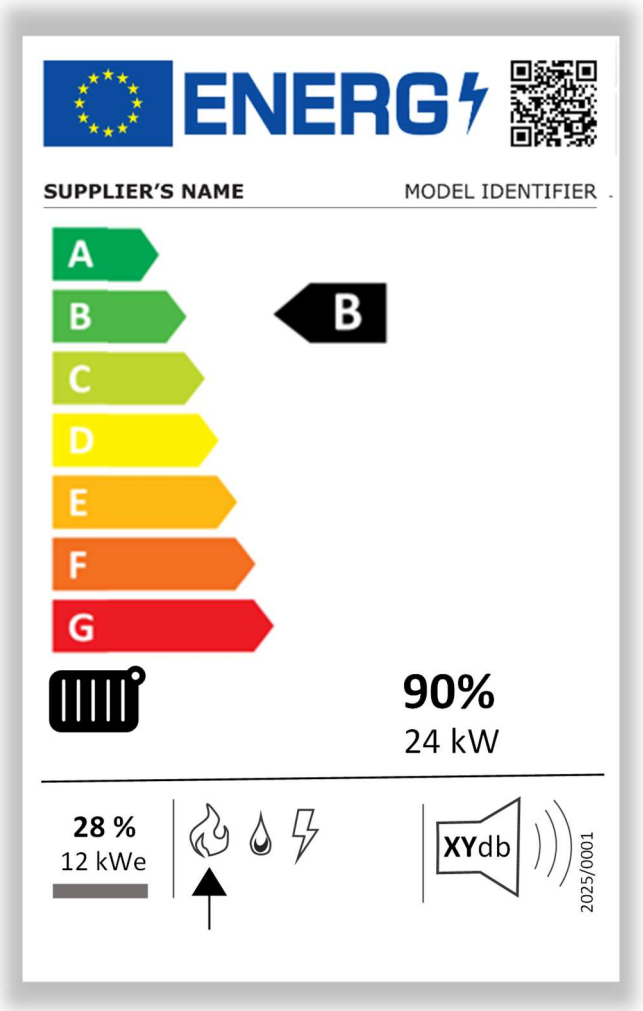
**Water heating energy efficiency classes by declared tapping profiles, lower class limits (except G class), $\eta_{wh}$ in %**

| **Class** | **Declared tapping profiles*** | | |
|---|---|---|---|
| | **S** | **M** | **L-XL-XXL-3XL-4XL** |
| A | ηwh ≥ 100 | ηwh ≥ 210 | ηwh ≥ 260 |
| B | 80 ≤ ηwh < 100 | 160 ≤ ηwh < 210 | 210 ≤ ηwh < 260 |
| C | 70 ≤ ηwh < 80 | 130 ≤ ηwh < 160 | 160 ≤ ηwh < 210 |
| D | 60 ≤ ηwh < 70 | 115 ≤ ηwh < 130 | 130 ≤ ηwh < 160 |
| E | 50 ≤ ηwh < 60 | 80 ≤ ηwh < 115 | 115 ≤ ηwh < 130 |
| F | 45 ≤ ηwh < 50 | 50 ≤ ηwh < 80 | 50 ≤ ηwh < 115 |
| G | ηwh < 45 | ηwh < 50 | ηwh < 50 |

*ANNEX III*

## The labels

### 1. Fossil fuel, electric resistance and cogeneration space heater




I

II, III

IV

V, VI

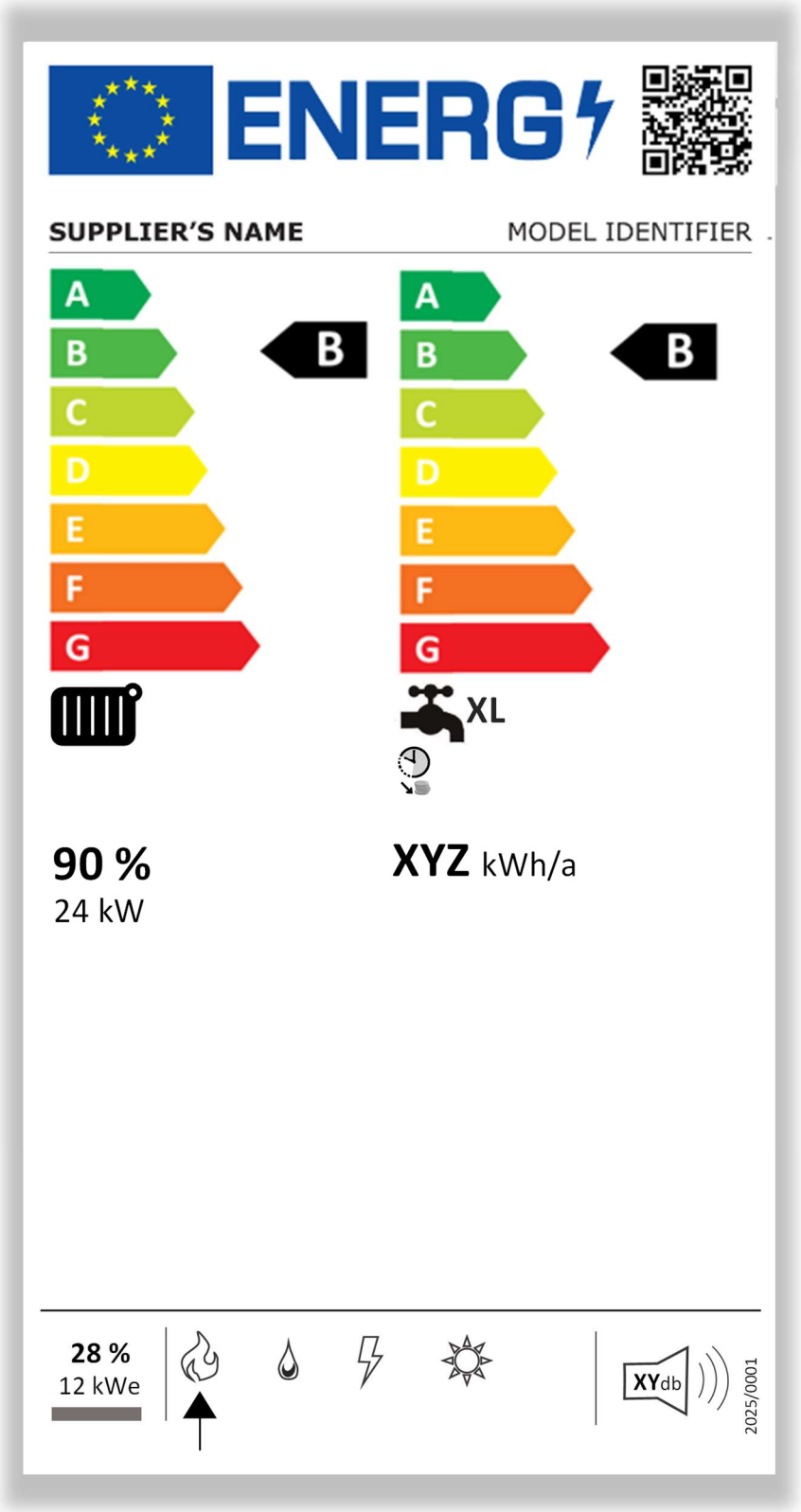
VII

I. QR Code
II. Suppliers name or trademark
III. Supplier's model identifier
IV. Seasonal space heating energy efficiency class (black arrow)
V. Symbol space heating
VI. Seasonal space heating energy efficiency value, in %
VII. Rated heat output ($P_4$), in kW

Symbols at the bottom (from left to right):

VIII. Cogeneration heater: grey bar + electric efficiency + electric power output (if no cogeneration then only grey bar)
IX. If gas-fired boiler then arrow below (otherwise no arrow below)
X. If liquid fuel-fired boiler then arrow below (otherwise no arrow below)
XI. If electric resistance boiler the arrow below (otherwise no arrow)
XII. Outdoor sound power

**2. Fossil fuel, electric resistance and cogeneration combination heater**




I

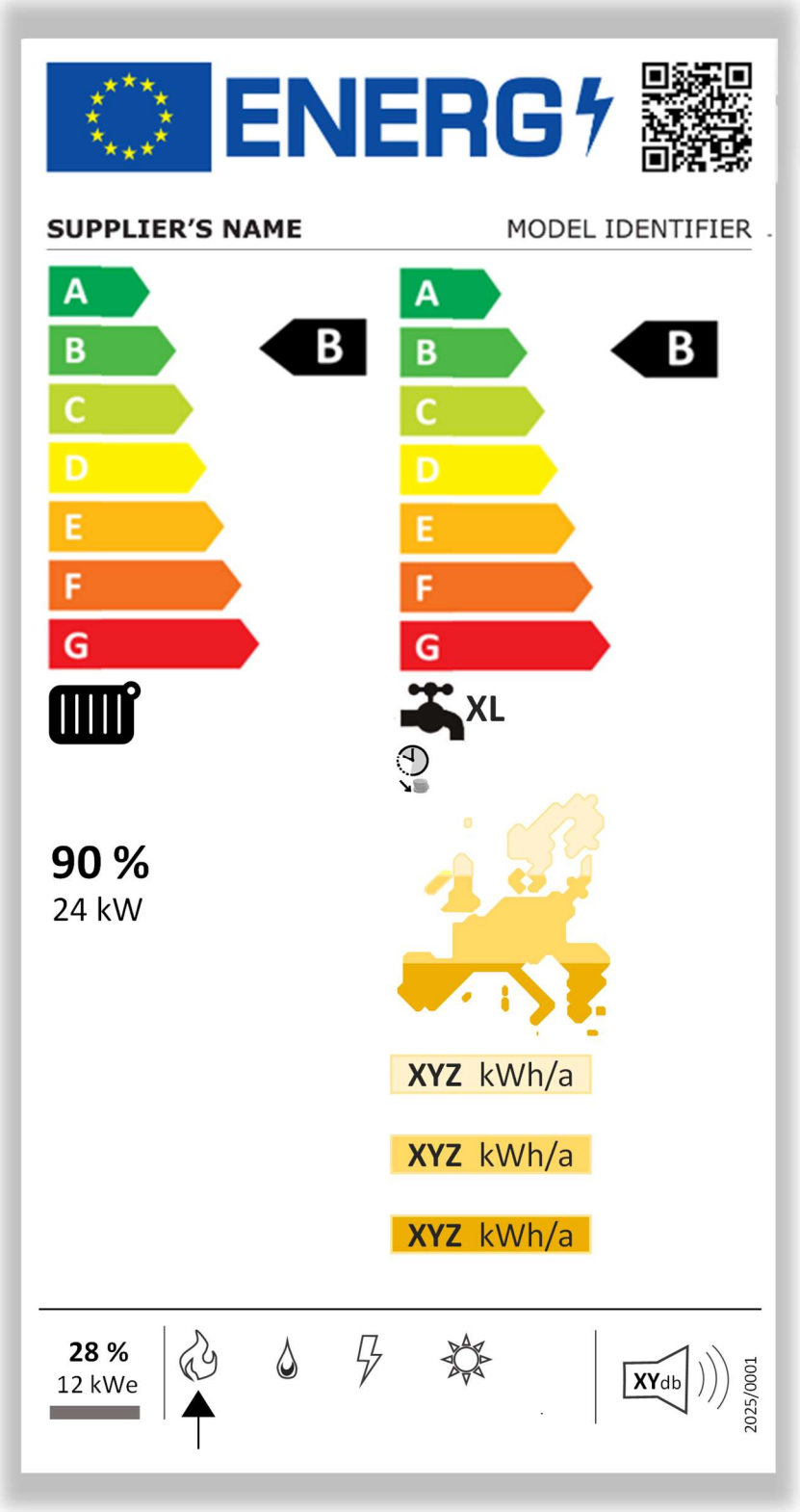
II,

III

IV

I. Water heating efficiency class
II. Declared tapping profile
III. If smart, then smart control symbol (otherwise void)
IV. Annual energy consumption (if all electric then in kWh electric otherwise in primary energy)

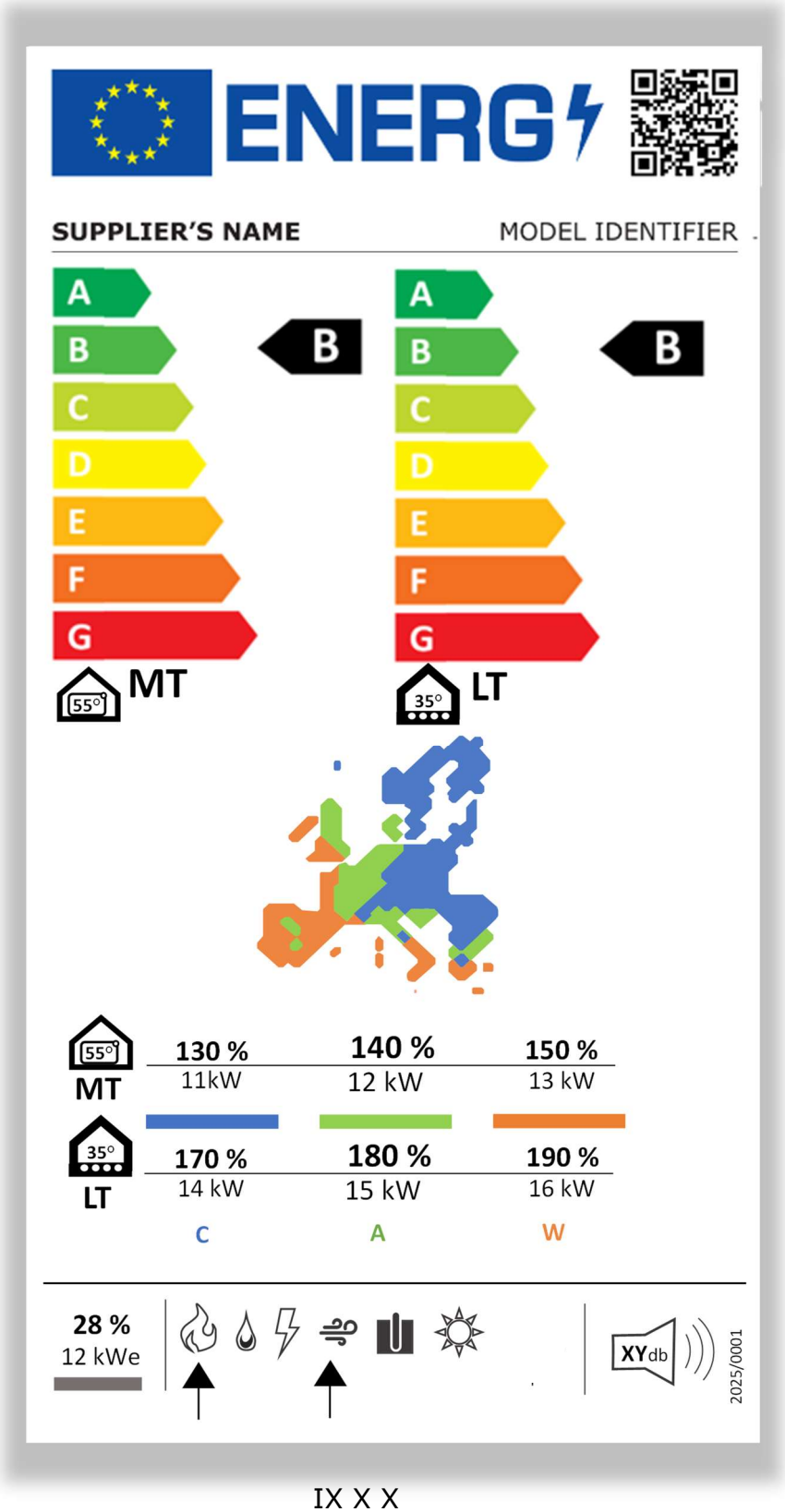
**3. Fossil fuel, electric resistance and cogeneration combination heater, solar assisted**




I
II
III
IV

I. Solar irradiance map (3 zones)
II. Low solar irradiance climate, annual water heating energy consumption
III. Average climate, annual water heating energy consumption
IV. High solar irradiance climate, annual water heating energy consumption

**4. Electric heat pump space heaters, thermally driven heat pump space heaters, hybrid space heaters**




I, II

III, IV

V

VI

VII

VIII

IX X X

I. Seasonal space heating energy efficiency class Medium Temperature regime (black arrow)
II. Seasonal space heating energy efficiency class Low Temperature regime (black arrow)
III. Medium Temperature regime symbol
IV. Low Temperature regime symbol
V. Climate map Europe with 3 temperature zones: Average=green, Warmer=orange, Colder=Blue. The colours refer to the columns in the table VI & VII.
VI. Medium temperature seasonal space heating energy efficiency and rated heat output per climate zone, the average climate performance determines the label classification I
VII. Low temperature seasonal space heating energy efficiency and rated heat output per climate zone, the average climate performance determines the label classification II
VIII. Abbreviations of the climate zones (C, A, W)
IX. If air- (and ventilation exhaust) source heat pump, stand-alone or in a hybrid, then arrow below (otherwise no arrow below)
X. If water (brine) source heat pump, stand-alone or in a hybrid, then arrow below (otherwise no arrow below)
XI. The sound power is the outdoor sound power of the heat pump, also in case of a hybrid.

Note that there can be more than one energy source with an arrow below. In this case this is a hybrid space heater with an air-source electric space heater with a gas-fired boiler. The symbols and the system of expressing most combination by symbols needs to fully developed, but in all cases it is intended for no more than a quick scan. The exact description of the product is part of the product information sheet and technical documentation.

### 5. Electric heat pump, thermally driven heat pump, hybrid combination heaters, solar-assisted

The Label 5 hereafter is probably the most complete and thus most complex to understand. It combines the space heating options of the previous label with solar assisted water heating. To the previous label it adds the water heating efficiency, solar map and annual energy consumption values for the three solar climate zones, but the colour codes are slightly different than in label 3 because there may be the option to combine the solar-assistance with the climate zone dependent water heating by the heat pump.

IMPORTANT NOTICES

1.

The examples here are illustrative only. After discussion of the elements of these illustrative designs, and on the basis of these discussions, the graphic design department of the Commission will prepare the final design.

2.

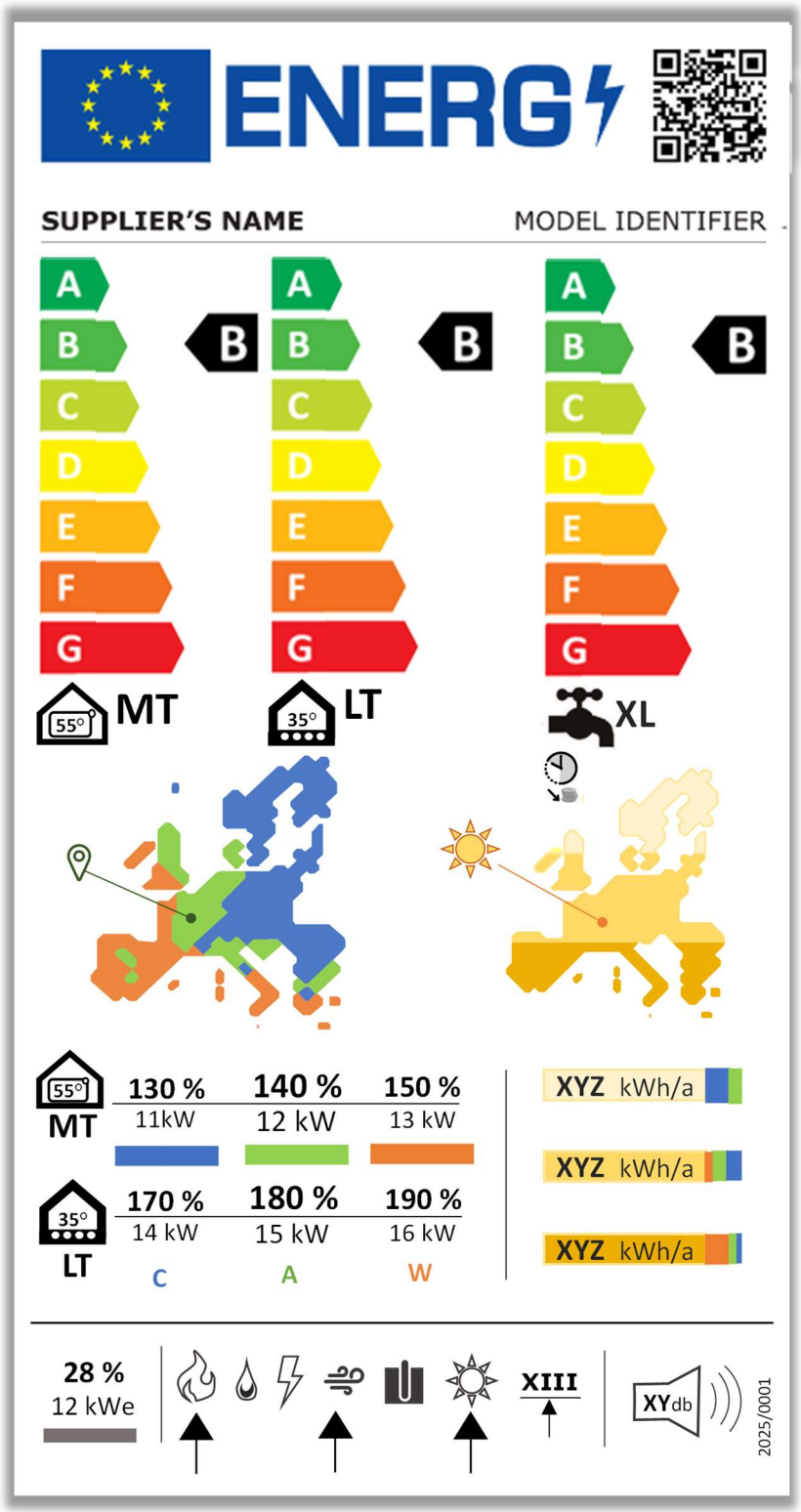
The illustrative designs are approximately –when printed out-- on a real scale, i.e. labels 2 to 5 are 20 cm high by 10,5 cm wide. This allows to judge legibility.

3.

While some other energy labels for household appliances may be largely understandable for an untrained consumer, this is not possible, unless for simple gas/oil/electric boilers, for the more complex hydronic central space heating and combination heaters. The primary target audience for this energy label is a trained professional installer that can use the energy label to gain a quick inside him/herself in the efficiency of products on the market, knowledge that he/she can then transfer to the final consumer backed up by a label that is anyway easier to understand –with the right explanation-- than the technical documentation. Market studies show that the installer is the main influencer of the hydronic central space/combination heater and in any case a prudent consumer will request offers from several of these installers.

**Label 5**

**Electric heat pump, thermally driven heat pump, hybrid combination heaters, solar-assisted**



**6. Change in space heating classes**

From [4 years after Date of application], for new product units: F and G classes of MT scale are greyed; G class of LT scale is greyed.

*ANNEX IV*

**Product information sheet**

1. GENERAL

The information in the product information sheet of the products presented hereafter shall be provided in the format of the tables given and shall be included in the product brochure or other literature provided with the product.

Where the product is a package with multiple different components, the appropriate tables have to be filled in for each component and for the package.

The information contained in the product information sheet may be given in the form of a copy of the label, either in colour or in black and white. Where this is the case, the information listed in point 1.1 not already displayed on the label shall also be provided. The product fiche required under Article 3, point (b), of Delegated Regulation (EU) No 811/2013 may be made available through the product database instead of being provided in printed form with the product. However, where the dealer so requests, the supplier shall ensure that the product fiche is made available in printed form.

The user manual or other literature provided with the product shall clearly indicate the link to the model in the product database as a human-readable Uniform Resource Locator (URL) or as a QR code or by providing the product registration number.

2. SPACE HEATING OF HEATERS

**Space heaters**

| | | | |
|---|---|---|---|
| Supplier's name or trademark: | | | |
| Model identifier: | | | |
| Combination heater | [y/n] if yes then fill in water heating sheet | | |
| Heater type: | [B1-boiler*/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 | [liquid fuel/gas/LPG] | | |
| Package | [No/Yes] [if Yes, then specify: with solar-device/ temperature control/ storage tank/ other space heater(s)/cascade of x of the same heaters | | |
| Energy label class space heating | [A..G] | | |
| Minimum part load kW (turndown ratio (%)) | x,x kW (x %) | | |
| | Average climate | | |
| Average climate, temperature regime (°C feed temp.) | Low (35°) | Medium (55°) | High (65°) |
| Energy label class space heating | [A..G] or -- | [A..G] or -- | -- |
| Rated heat output (kW) | x,x | x,x | x,x |
| Seasonal energy efficiency space heating etas (%) | x | x | x |
| Annual energy consumption QHE (kWh/a) | x | x | x |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sound power level outdoor / indoor LWA (dB(A)) for heat pump heater and hybrid heat pump | x | | | | | |
| Specific information on assembly, installation, maintenance as well as disassembly, recycling and/or disposal at end-of-life. | [in separate text section] | | | | | |
| Cogeneration electric power output (kW) | x,x | | | | | |
| For heat pump and hybrid heat pump only | Warmer climate | | | Colder climate | | |
| Temperature regime in °C | 35° | 55° | 65° | 35° | 55° | 65° |
| Rated heat output (kW) | x,x | x,x | x,x | x,x | x,x | x,x |
| Seasonal energy efficiency space heating *etas* (%) | x | x | x | x | x | x |
| Annual energy consumption $Q_{HE}$ (kWhe/a) | x | x | x | x | x | x |

*If B1-boiler then place the following text here below the table: '*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.'*

## 3. WATER HEATING OF COMBINATION HEATERS

**Water heating**

| | | |
|---|---|---|
| Supplier's name or trademark: | | |
| Model identifier: | | |
| Package | [No/Yes] if Yes, then specify: with solar device/ space heater with indirect tank/ space heater with indirect tank and solar-device/cascade of x of the same combination heaters | |
| Load Profile declared (as Table 9) | [S..4XL] | |
| Alternative Load Profile declared, if any [3XS..4XL]: | [S..4XL] | |
| Energy label class: | [A..G] | |
| Thermostat temperature setting, as sold | °C | |
| Sound power level heat pump outdoor | dB(A) | |
| Operating at off-peak hours? | [y/n] | |
| Smart control? | [y/n] | |
| Smart control factor | x,xxx | |
| | | |
| For all combination heaters | Average climate | |
| Water heater efficiency (ηwh) | x % | |
| Annual electricity consumption (AEC) | x kWhe/a | |
| Annual fuel consumption (AEF, in GCV) | x kWh /a | |
| | | |
| For heat pump combination heaters | Warmer climate | Colder climate |
| Water heater efficiency (ηwh) | x% | x,x |
| Annual electricity consumption (AEC) | x kWhe/a | x kWhe/a |
| Annual fuel consumption (AEF, in GCV) | x kWh /a | x kWh /a |

## 4. TEMPERATURE CONTROL

**Temperature control**

| | |
|---|---|
| Supplier's name or trademark: | |
| Model identifier: | |
| Class of the temperature control | [I..VIII] |

| | |
|---|---|
| Contribution of the temperature control to seasonal space heating energy efficiency | x,x % |

5. HOT WATER STORAGE TANK

**Hot water storage tank (**with packages of solar devices and/or with space heaters converted to combination heaters, data to be taken from product information sheet of the tank)

| | |
|---|---|
| Supplier's name or trademark: | |
| Model identifier: | |
| Storage volume in litres | x |
| Standing loss in W | x |
| Multivalent tank | [y/n] |
| Energy efficiency class of the model | [A..D] |
| | |
| | |
| | |

6. SOLAR DEVICES

**Solar devices**

| | |
|---|---|
| Supplier's name or trademark: | |
| Model identifier: | |
| Solar device efficiency factor for space heating (per climate: for chosen collector surface and given annual heating demand, in%), *to be supplied in table format* | [x,xx look-up table] |
| Solar device efficiency factor for water heating (per climate: for collector surface versus tapping load profile, in%), *to be supplied in table format* | [x,xx look-up table] |
| | |
| | |
| Tank factor $f_{tank}$ | x,xx |

*Example of look-up table for solar device efficiency factor*

| **Climate** [a] | **Number of solar collectors / module or gross area of collector array** [a] | **Load profiles** [a] | | | | | |
|---|---|---|---|---|---|---|---|
| | | **M** | **L** | **XL** | **XXL** | **3XL** | **4XL** |
| Average | e.g. 2 collectors / 4 m$^2$ | x % | x % | x % | x % | minimum is 100% | |
| | e.g. 3 collectors / 6 m$^2$ | etc. | etc. | etc. | etc. | etc. | etc. |
| | etc. | maximum is 450% | | x % | x % | x % | x % |
| Warmer | e.g. 2 collectors / 4 m$^2$ | for each applicable combination of number of collectors, load profile and climate, the Solar device efficiency factor for water heating shall be provided (see example for 'Average' climate)<br><br>Consider the minimum and maximum values for solar device efficiency indicated in Annex VIII | | | | | |
| | e.g. 3 collectors / 6 m$^2$ | | | | | | |
| | etc. | | | | | | |

| | | |
|---|---|---|
| Colder | e.g. 2 collectors / 4 $m^2$ | etc.<br><br>Consider the minimum and maximum values for solar device efficiency indicated in Annex VIII |

7. PACKAGE OF COMBINATION HEATER AND SOLAR DEVICE

**Package of combination heater and solar device, water heating (**Solar device efficiency factors and tank factor from product documentation of solar device)

| | |
|---|---|
| Water heating efficiency of combination heater (without solar assistance) | x% |
| Load Profile declared | [S..4XL] |
| Gross collector surface chosen ($m^2$) | x,x |
| Solar device efficiency factor for water heating from look-up table | x,x |
| Tank factor from hot water storage tank chosen | x,x |
| Package water heating efficiency solar-assisted combination boiler | x% |

8. PACKAGE OF COMBINATION HEATER AND SHOWER WATER HEAT RECOVERY DEVICE

**Package of combination heater and Shower water heat recovery device**

| | |
|---|---|
| Load Profile declared | [S..4XL] |
| Water heating efficiency (combination heater without shower water heater device) | x% |
| Shower water heat recovery device efficiency, per flow rate, in l/min (see table below) | x,xx |
| Shower water heat recovery device factor ($f_{DWHRD}$) in decimals, per load profile,<br>to be supplied in table format for multiple load profiles (see example table below) | x,xx |
| Shower water heat recovery package water heating efficiency | x% |

**Shower water heat recovery device, example table**

| | |
|---|---|
| Supplier's name or trademark: | |
| Model identifier: | |

Shower water heat recovery device factor ($f_{SWHRD}$), in decimals, per applicable load profile
(to be used by dealers to calculate water heating energy efficiency of water heater package)

| **Load profile** | XS | S | M | L | XL | XXL | 3XL | 4XL |
|---|---|---|---|---|---|---|---|---|
| **$f_{SWHRD}$** | x | x | x | x | x | x | x | x |
| Shower water heat recovery efficiency, as tested, per flow rate | | | | | | | flow rate (l/min) | efficiency (%) |
| (results for sole, or highest, flow rate) | | | | | | | x | x,xx% |
| (optional: if tested at lower flow rate as well) | | | | | | | x | x,xx% |

9. PACKAGE OF SPACE HEATER CONVERTED TO COMBINATION HEATER

**Package of fuel and electric resistance space heaters and hot water storage tank** (+three-way valve), **water heating**

| | |
|---|---|
| Load Profile declared | [S..4XL] |
| Rated heat output of space heater (kW) | x,x |
| Efficiency at rated heat output of space heater (%) | x% |
| Standby heat loss of space heater (kW) | x,xx |
| Minimum (auxiliary) electricity use of space heater elmin (kW) | x,xxx |
| Maximum (auxiliary) electricity use of space heater elmax (kW) | x,xxx |
| Standing heat loss of hot water storage tank (W) | x |
| Package water heating efficiency of fuel- and electric resistance space heater converted to combination boiler | x% |
| Package water heating efficiency of heat pump space heater converted to combination boiler | x% |

## 10. PACKAGES OF SPACE HEATERS

**Packages of space heaters, solar devices, temperature control, space heating**

| | |
|---|---|
| Rated heat output of each space heater in the package, climate specific as appropriate (kW) | x,xx |
| Seasonal space heating efficiency of each space heater in the package (%) | x% |
| Cogeneration heater electric power output (kW) | x,xx |
| Temperature control class | [I..VIII] |
| Temperature control contribution | x,x% |
| Gross collector surface chosen (m²) | x,x |
| Solar device efficiency factor for water heating (from look-up table) | x,x |
| Tank factor from hot water storage tank chosen | x,x |
| Package space heating efficiency | x% |

*ANNEX V*

**Technical documentation**

REQUIREMENTS FOR TECHNICAL DOCUMENTATION

1. ALL

For all products in scope, the technical documentation referred to in Article 3 second subparagrah letter (c) shall include:

(a) the name and address of the supplier;

(b) a description of the heater model sufficient for its unambiguous identification;

(c) where appropriate, the references of the harmonised standards applied;

(d) where appropriate, the other technical standards and specifications used;

(e) the identification and signature of the person empowered to bind the supplier;

(f) any specific precautions that shall be taken when the product is assembled, installed or maintained.

2. SPACE- AND COMBINATION HEATERS

From [date] the following technical information on space- and combination heaters shall be provided:

1. the instruction manuals for installers and end-users, and free access websites of manufacturers, their authorised representatives and importers shall contain:

a) the technical parameters set out in Table 1 of Annex II, as defined in Annex, measured and calculated in accordance with Annex VIII, and as appropriate supplemented by transitional methods set in Annex IX, 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 heater 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.

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

(c) 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.';

(d) 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;

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

2. The technical documentation for the purposes of conformity assessment pursuant to Article 4 shall contain the following elements:

(a) the elements specified in point 2 a above;

(b) 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

3) The following information shall be durably marked on the heater:

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

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

*Table 1.*

**Technical documentation for heat pump and hybrid space heaters**

| | |
|---|---|
| Manufacturer: | |
| Model identifier: | |
| Product: | [fuel boiler/ electric boiler/ cogeneration heater/ electric heat pump/ thermally driven (TD) heat pump/ hybrid heater] |
| Heat pump ambient 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

| ***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) | *part load settings* ***f*** Hz etc. (x) | ***qwe/ qwc*** m³/h (x,x) | ***Pcyc/ Tcyc*** kW/°C (x,x)/(x) | ***elbu fuelbu*** kW (x,xx) | ***$COP_{bin}$ $GUE_{bin}$*** (-) (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*** | |

| ***sound power & other, heat pump*** | ***capa-city control*** [y/n] | ***LWA indoor dB(A)*** (x) | ***LWA outdoor dB(A)*** (x) | ***LWA corrected*** (y/n) | *ventilation heat pump only* ***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) | ***$Q_{aux}$*** kW (x,x) | ***$SAEF_{on}$*** kW (x,x) | ***QH*** kWh/a (x) | ***QHE*** kWh/a (x) | ***etas*** heat pump (%) (x) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

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

| ***boiler, cogeneration heater and hybrid (fuelbu)*** | ***$P_4$*** kW (x,x) | ***$P_1$*** kW (x,x) | ***$P_0$*** kW (x,x) | ***eta4*** (%) (x) | ***eta1*** (%) (x) | ***eta0*** (%) (x) | ***B1 boiler*** (y/n) | ***NOx*** mg/kWh (x) |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

| ***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) | *cogeneration* ***Pel*** kW (x,x) | ***Phs*** kW (x,x) | ***etas*** boiler/cogen/ hybrid (%) (x) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

| C. STORAGE TANKS/ SOLAR DEVICES | | | | | | |
|---|---|---|---|---|---|---|
| ***HOT WATER STORAGE TANK*** | | | | | | |
| ***standing loss (S)*** in W | ***Volume (V)*** in L | ***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) | $\eta_{wh}$ (%) (x) |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

2. TEMPERATURE CONTROLS

For temperature controls, the technical documentation referred to in Article 3(3)(c) shall include the results of the measurements for the technical parameters as specified in point 4 of Annex IV;

3. HOT WATER STORAGE TANKS

For hot water storage tanks, the technical documentation shall include the results of the measurements for the technical parameters as specified in point 5 of Annex IV;

4. SOLAR DEVICES AND PACKAGES OF HEATERS WITH SOLAR DEVICES

For solar devices, the technical documentation referred to in Article 3(4)(c) and 3(6)(c) shall include the results of the measurements for the technical parameters as specified in point 6 and 7 of Annex IV;

7. PACKAGE OF SPACE HEATER CONVERTED TO COMBINATION HEATER

For space heaters converted to combination heaters, the technical documentation referred to in Article 3(6)(c) shall include the results of the measurements for the technical parameters as specified in point 8 of Annex IV;

6. PACKAGES OF SPACE HEATER, TEMPERATURE CONTROL AND SOLAR DEVICE

For packages of space heater, temperature control and solar device, the technical documentation referred to in Article 3(5)(c) shall include the results of the measurements for the technical parameters as specified in point 9 of Annex IV;

*ANNEX VI*

**Information to be provided in visual advertisements, in technical promotional material or other promotional material, in distance selling except distance selling on the internet**

1) In visual advertisements for *the products in the scope*, for the purposes of ensuring conformity with the requirements laid down in point 1(e) Article 3 and point (c) of Article 4, the energy efficiency class and the range of energy efficiency classes available on the label shall be shown as set out in point 4 of this Annex.

2) In technical promotional material or other promotional material for *heaters and/or packages of heaters with solar devices, hot water storage tanks and/or shower water heat recovery devices*, for the purposes of ensuring conformity with the requirements laid down in point 1(f) Article 3 and point (d) of Article 4 the energy efficiency class and the range of energy efficiency classes available on the label shall be shown as set out in point 4 of this Annex.

3) Any paper-based distance selling of water heaters, storage tanks and/or packages of water heaters with solar devices, hot water storage tanks and/or Shower water heat recovery devices must show the energy efficiency class and the range of energy efficiency classes available on the label as set out in point 4 of this Annex.

4) The energy efficiency class and the range of energy efficiency classes shall be shown, as indicated in Figure 2, with:

   a) an arrow containing the letter of the energy efficiency class, in white, Calibri Bold and in a font size at least equivalent to that of the price, if the price is shown, in all other cases clearly visible and legible font size;

   b) the colour of the arrow matching the colour of the energy efficiency class;

   c) the range of available energy efficiency classes if the label class rating is not climate dependent or the applicable climate if the label class rating is climate dependent in 100 % black; and

   d) the size shall be such that the arrow is clearly visible and legible. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow, with a border of 0,5 pt in black around the arrow and the letter of the energy efficiency class.

By derogation, if the visual advertisement, technical promotional material or other promotional material or paper-based distance selling is printed in monochrome, the arrow can be in monochrome in that visual advertisement, technical promotional material, other promotional material or paper based distance selling.

*Figure 1 Coloured/monochrome left/right arrow, if not climate dependent*

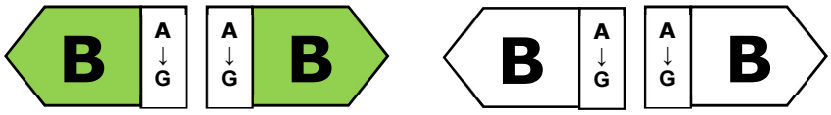
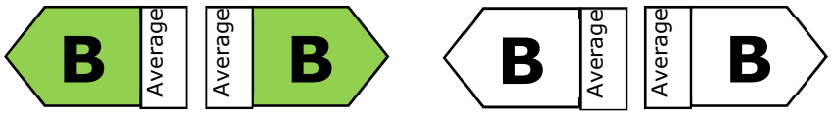



*Figure 2 Coloured/monochrome left/right arrow, if climate dependent*



5) Telemarketing based distance selling must specifically inform the customer of the energy efficiency class of the product and of the range of energy efficiency classes available on the label, and that the customer can access the full label and the product information sheet through a free access website, or by requesting a printed copy.

6) For all the situations mentioned in points 1 to 3 and 5, it must be possible for the customer to obtain, on request, a printed copy of the label and the product information sheet.

*ANNEX VII*

**Information to be provided in the case of distance selling through the internet**

1) The appropriate label made available by suppliers in accordance with point 1(g) of Article 3 shall be shown on the display mechanism in proximity to the price of the product, if the price is shown, and in all other cases in proximity to the product. The size shall be such that the label is clearly visible and legible and shall be proportionate to the size specified in point 4 of Annex III. The label may be displayed using a nested display, in which case the image used for accessing the label shall comply with the specifications laid down in point 3 of this Annex. If nested display is applied, the label shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the image.

2) The image used for accessing the label in the case of a nested display, as indicated in Figure 2, shall:

   a) be an arrow in the colour corresponding to the energy efficiency class of the product on the label;

   b) indicate the energy efficiency class of the product on the arrow in white, Calibri Bold and in a font size equivalent to that of the price, if the price is shown, in all other cases a clearly visible and legible font size; and

   c) have the range of available energy efficiency classes in 100 % black; and,

   d) have one of the following two formats, and its size shall be such that the arrow is clearly visible and legible. The letter in the energy efficiency class arrow shall be positioned in the centre of the rectangular part of the arrow, with a visible border in 100 % black placed around the arrow and the letter of the energy efficiency class:

*Figure 3 Coloured/monochrome left/right arrow, if not climate dependent*

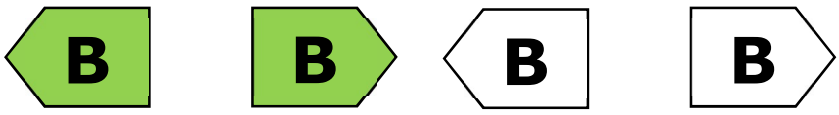
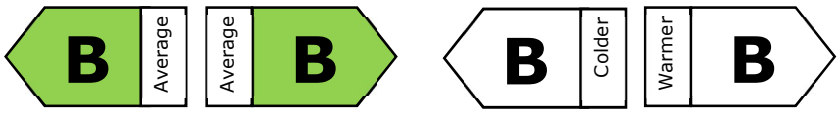



*Figure 4 Coloured/monochrome left/right arrow, if climate dependent*




(Example shows "Average" in coloured arrows, and "Colder" and "Warmer" in monochrome arrows)

3) In the case of a nested display, the sequence of display of the label shall be as follows:

   a) the image referred to in point 2 of this Annex shall be shown on the display mechanism in proximity to the price of the product, if the price is shown, and in all other cases in proximity to the product;

   b) the image shall link to the label set out in Annex III;

   c) the label shall be displayed after a mouse click, mouse roll-over or tactile screen expansion on the image;

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

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

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

g) the alternative text for the graphic, to be displayed on failure to display the label, shall be the energy efficiency class of the product in a font size equivalent to that of the price, if the price is shown, and in all other cases a clearly visible and legible font size.

4) The electronic product information sheet made available by suppliers in accordance with point 1(g) of Article 3 shall be shown on the display mechanism in proximity to the price of the product, if the price is shown, and in all other cases in proximity to the product. The size shall be such that the product information sheet is clearly visible and legible. The product information sheet may be displayed using a nested display or by referring to the product database, in which case the link used for accessing the product information sheet shall clearly and legibly indicate 'Product information sheet'. If a nested display is used, the product information sheet shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the link.

*ANNEX VIII*

**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, 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 14 of this annex

c) The method for establishing the seasonal energy efficiency ($\eta_s$) 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 $\eta_{son}$ 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 $\eta_s$**

(a) for fuel boilers, electric boilers and cogeneration space heaters $\eta_s$ is the seasonal space heating energy efficiency in active mode' ($\eta_{son}$ ) 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 $\eta_s$ 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 $Q_H = P_{designh} \times H_{eH}$

– 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 4 .

$H_{eH}$ is equivalent annual hours in on-mode, set out in Table 5.

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

where $E_{aux}$ 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)**

| ***Climate*** | | ***Average (A)*** | ***Warmer (W)*** | ***Colder ( C)*** |
|---|---|---|---|---|
| Reference design temperature | $T_{designh}$ | – 10 (– 11) °C | +2 (+1) °C | – 22 (– 23) °C |
| Bivalent temperature | $T_{biv}$ | maximum + 2 °C | maximum + 7 °C | maximum -7 °C |
| Operation Limit temperature | *TOL* | maximum -7 °C | maximum +2 °C | maximum -15 °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 specific heat capacity of air (0.000344 kWh/m3*h) 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 for heating only (h/y)**

| Type of heat pump & –*climate* | on mode | thermostat-off mode | standby mode | off mode | crankcase heater mode |
|---|---|---|---|---|---|
| **Heating only** | $H_{eH}$ | $H_{TO}$ | $H_{SB}$ | $H_{OFF}$ | $H_{CK}$ |
| –*Average* | 2066 | 178 | 0 | 3672 | 3850 |
| –*Warmer* | 1336 | 754 | 0 | 44126 | 5170 |
| –*Colder* | 2465 | 106 | 0 | 2208 | 2314 |
| | | | | | |
| **Reversible** | $H_{eH}$ | $H_{TO}$ | $H_{SB}$ | $H_{OFF}$ | $H_{CK}$ |
| –*Average* | 2066 | 178 | 0 | 0 | 178 |
| –*Warmer* | 1336 | 754 | 0 | 0 | 754 |
| –*Colder* | 2465 | 106 | 0 | 0 | 106 |

(c) for thermally driven heat pumps $\eta_s$ 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

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

with

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

where *SGUE* is the seasonal gas utilisation efficiency (only in on-mode by definition), *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 $\eta_{son}$

(a) for fuel boilers, $\eta_{son}$ is weighted average of the useful efficiency $\eta_4$ at rated heat output $P_4$ and the useful efficiency $\eta_1$ 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, $\eta_{son}$ is the useful efficiency $\eta_4$ 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 $\eta_{son}$ 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 $\eta_{son}$ 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') and at $P_{designh}$, as indicated in Table 4 for the three climate conditions;

The average, warmer and colder 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 climate-specific part load test conditions for outdoor temperatures $T_j$('bins') and $P_{designh}$, as indicated in Table 5. 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

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

Also 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

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

(d) for thermally driven heat pumps, the $\eta_{son}$ 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. Apart from those issues, the calculation of *SGUE* and $SAEF_{on}$ is similar to that of $SCOP_{on}$:

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

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

## 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 Condition** | **Part Load Ratio in %** | | | **Outdoor heat exchanger** | | | | **Indoor heat exchanger (emitter temperatures)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Climates (A=Average, W=Warm, C=Cold) | | | Inlet dry (wet) bulb or liquid inlet/outlet temperature in °C | | | | Tempera-ture regime | outlet*** inlet/outlet* temperature in °C | | |
| | ***A*** | ***W*** | ***C*** | ***Outdoor air*** | ***Exhaust air*** | ***Water*** **** | ***Brine*** **** | ***Climates*** | ***A*** | ***W*** | ***C*** |
| **A** | 88 | n/a | 61 | −7(−8) | 20(15) | 10/7 | 5/2 | LT | */34 | n/a | */30 |
| | | | | | | | | MT | */52 | n/a | */44 |
| | | | | | | | | HT | */61 | n/a | */50 |
| **B** | 54 | 100 | 37 | 2(1) | 20(15) | 10/7 | 5/2 | LT | */30 | */35 | */27 |
| | | | | | | | | MT | */42 | */55 | */37 |
| | | | | | | | | HT | */49 | */65 | */41 |
| **C** | 35 | 64 | 24 | 7(6) | 20(15) | 10/7 | 5/2 | LT | */27 | */31 | */25 |
| | | | | | | | | MT | */36 | */46 | */32 |
| | | | | | | | | HT | */41 | */53 | */36 |
| **D** | 15 | 29 | 11 | 12(11) | 20(15) | 10/7 | 5/2 | LT | */24 | */26 | */24 |
| | | | | | | | | MT | */30 | */34 | */28 |
| | | | | | | | | HT | */32 | */39 | */30 |
| **E** | (TOL – 16) / ($T_{designh}$ – 16) | | | TOL | 20(15) | 10/7 | 5/2 | all | ** | ** | ** |
| **F** | ($T_{biv}$ – 16) / ($T_{designh}$ – 16) | | | $T_{biv}$ | 20(15) | 10/7 | 5/2 | all | ** | *** | *** |
| **G** | n/a | n/a | 82 | −15 | 20(15) | 10/7 | 5/2 | LT | n/a | n/a | */32 |
| | | | | | | | | MT | n/a | n/a | */49 |
| | | | | | | | | HT | n/a | n/a | */57 |
| ***$T_{designh}$*** | 100 | 100 | 100 | A/W/C: −10(−11)/ +2(+1)/ −22(−23) | 20(15) | 10/7 | 5/2 | LT | */35 | | |
| | | | | | | | | MT | */55 | | |
| | | | | | | | | HT | */65 | | |

* = for outdoor and exhaust air source the variable outlet supply temperature is calculated from interpolation of the supply temperatures between heating design temperature *Tdesignh* ( -10 °C, +2 °C, -15 °C for Average, Warmer and Colder climate, respectively) and supply/return temperatures at test conditions higher than and closest to *TOL*. For water- or brine source heat pumps the supply temperatures are 35 (LT), 55(MT) or 65°C(HT). The return temperature is 5K (LT), 8K (MT) or 10K (HT)less than the supply temperature, unless the flow rate is lower than the minimum flow rate declared by the manufacturer. In that case the return temperature can change. The feed temperature changes (increases) if cycling occurs.

** = calculated from interpolation of supply/return temperatures at test conditions higher and lower than and closest to $T_{biv}$ or TOL as applicable;

*** = If the outlet temperature is below the minimum of the operation range of the unit, this minimum should be considered.

**** = Also covers direct exchange-to-water(brine) heat pumps (DX-to-water(brine)). DX 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*

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

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

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

## 6. WATER HEATING ENERGY EFFICIENCY $\eta_{wh}$ OF A COMBINATION HEATER

WATER HEATING TEST CONDITIONS

(a) For all combi 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 combi heater, or the load profile with a reference energy just below the largest that can be supplied, as set out in Table 5, 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 5;
- 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 3, 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 combi water heating: dry bulb air temperatures (wet bulb temperatures in brackets)***

| 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 | 320 | 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) To measure the mixed water at 40 °C (*V40*) of a storage combi heater or PCM tank, the product is kept at its nominal operating temperature $T_{set}$ (in °C) for at least 12 hours and then, at the end of the first thermostat cut-out thereafter, is switched off and the water is withdrawn at the maximum flow rate in the declared load profile until the water temperature at the outlet, measured and registered at the most at every 3s, drops below 40 °C. The cold water at temperature $\Theta_c$ is nominally 10 °C. The average outlet temperature during withdrawal $\Theta'_p$ (in °C) is assessed, corrected for sharp fluctuations in temperature readings as appropriate. The normalised value of $\Theta'_p$ is $\Theta_p$ (in °C), which is calculated as

$$\Theta_p = (\mathrm{T}_{set} - 10)\frac{(\Theta'_p - \Theta_c)}{(T_{set} - \Theta_c)} + 10$$

$\Theta_p$ and the volume of the hot water withdrawn with temperature ≥40 °C $V_{40exp}$ (in litres) are the inputs for the calculation of *V40* in section 4, sub (d);

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

WATER HEATING CALCULATION METHODS

(a) The water heating energy efficiency $\eta_{wh}$, 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:

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

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 8 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 $\eta_{wh}$ 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.

(d) The mixed water at 40 °C (*V40*), in litres of 40 °C water, is based on the input values assessed in section 3, sub (k) and calculated as

$$V40 = V_{40\_exp} \times \frac{(\Theta_p - 10)}{30}$$

(e) The equivalent volume $V_{eq}$, in litres, of a PCM tank or other storage facility capable of producing hot water at temperatures of 65 °C is calculated from its V40 value as assessed in sub (d),

$$V_{eq} = V40 \times \frac{30}{(\Theta_p - 10)}$$

based on $\Theta_c$ of +10 °C, Tset of +65 °C and $\Theta_p$ equals $\Theta'_p$ , the normalised average temperature $\Theta_p$ during withdrawal is 40+(65–40)/2= 52.5 °C the default formula becomes

$$V_{eq} = 0.706 \times V40$$

Note to CF: The testing and calculation of mixed water at 40°C (*V40*) is now described adequately in the appropriate standards in Annex IX 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** | | | | | | | | |

| 4XL | | | | |
|---|---|---|---|---|
| h | $Q_{tap}$ | $f$ | $T_m$ | $T_p$ |
| | 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 thermosyphon / ICS solar device ).

The standards as referenced in Annex VIIa 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 liter 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 IX.

(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 IX, in kWh/a;

(3) The solar device efficiency for water heating $\eta$ is calculated per climate condition as:

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

– 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 |
| Colder | -0.52 | 1.94 | 0.60 | 0.28 |
| Warmer | 1.17 | 0.59 | 0.83 | 0.50 |

- $f_{profile}$ 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 |

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

– $f_{\text{tank}}$– 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** |
|---|---|---|---|---|
| Storage tank correction factor $f_{tank}$ | 1.20 | 1.15 | 1.1 | 1.05 |

(c) Solar device efficiency for space heating

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

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

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.[9]

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

[9] 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 |
| Colder | 0.00 | 0.61 | 1.00 |
| Warmer | 0.17 | 0.23 | 1.00 |

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

## 8. TEMPERATURE CONTROLS

(a) Definitions

- Class I – Room Thermostat, on/off: A room thermostat that controls the on/off operation of a heater. Performance parameters, including switching differential and room temperature control accuracy are determined by the thermostat's mechanical construction.
- Class II – Weather compensator control, modulating: A heater flow temperature control that varies the set point of the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. Control is achieved by modulating the output of the heater.
- Class III – Weather compensator control, on/off: A heater flow temperature control that varies the set point of the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. Heater flow temperature is varied by controlling the on/off operation of the heater.
- Class IV – A generic load compensating control, proportional on/off. TPI controls and other similar control devices that use different algorithms. TPI and similar control strategies reduces mean water temperature, improve room temperature control accuracy and enhance system efficiency.
- Class V – Modulating room thermostat, modulating: An electronic room thermostat that varies the flow temperature of the water leaving the heater dependent upon measured room temperature deviation from room thermostat set point. Control is achieved by modulating the output of the heater.
- Class VI – Weather compensator and room sensor, modulating: A heater flow temperature control that varies the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. A room temperature sensor monitors room temperature and adjusts the compensation curve parallel displacement to improve room comfort. Control is achieved by modulating the output of the heater.
- Class VII – Weather compensator and room sensor, on/off: A heater flow temperature control that varies the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. A room temperature sensor monitors room temperature and adjusts the compensation curve parallel displacement to improve room comfort. Heater flow temperature is varied by controlling the on/off operation of the heater.

– Class VIII – Multi-sensor room temperature control, modulating or proportional on/off: An electronic control, equipped with 3 or more room sensors that varies the flow temperature of the water leaving the heater dependent upon the aggregated measured room temperature deviation from room sensor set points. Control is achieved by modulating or using a proportional on/off strategy to regulate the output of the heater.

(b) Classes

Contribution of temperature controls to seasonal space heating energy efficiency of space heaters or packages of heater(s), temperature control and solar device

| Class No. | | TC (%) |
|---|---|---|
| I | On/off Room Thermostat | 1 |
| II | Weather compensator control, for use with modulating heaters | 2 |
| III | Weather compensator control, for use with on/off output heaters | 1.5 |
| IV | TPI room thermostat, for use with on/off output heaters | 2 |
| V | Modulating room thermostat, for use with modulating heaters | 3 |
| VI | Weather compensator and room sensor, for use with modulating heaters | 3.5 |
| VII | Weather compensator and room sensor, for use with on/off output heaters | 3 |
| VIII | Multi-sensor room temperature control, for use with modulating heaters | 5 |

The TC values (in %) are added to the parameter *F(1)* as set out in section 5.

## 9. PACKAGES OF SPACE HEATERS, SOLAR DEVICES, TEMPERATURE CONTROLS

The seasonal space heating efficiency of a package of space heater(s), solar devices and temperature controls $\eta_{s,pack}$ 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, increased by the temperature control value *TC* as set out in point 10:

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

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, climate specific** | | | | **seasonal space heating efficiency, climate specific** | | | | **active mode heating hours, climate specific** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ***k*** | ***P(k)*** | **A** | **W** | **C** | ***etas(k)*** | **A** | **W** | **C** | ***H(k)*** | **A** | **W** | **C** |
| | | **parameter** | ***kW*** | ***kW*** | ***kW*** | **para-meter** | ***%*** | ***%*** | ***%*** | **para-meter** | ***h/a*** | ***h/a*** | ***h/a*** |
| Cogeneration heater | 1 | *Pdesign chp* | | | | *etas chp* | | | | *H chp* | 4910 | 6446 | 3590 |
| Heat pump electric heater | 2 | *Pdesign hp* | | | | *etas hp* | | | | *H other heater* | 2066 | 1336 | 2465 |
| 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* | | | | | | | |

| **Temperature control TC** | ***unit*** | **class** | **%** |
|---|---|---|---|
| TC (option for label rating) | I.. VIII | | |

| **cogeneration heater** | | |
|---|---|---|
| P el | kW | |

| **Solar device-assisted space heating** | | |
|---|---|---|
| *etasol,sh* | % | |
| $f_{tank}$ | - | |

– *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** |
|---|---|---|---|---|
| Storage tank correction factor $f_{tank}$ | 1.20 | 1.15 | 1.1 | 1.05 |

## 10. PACKAGES OF COMBINATION HEATERS, SOLAR DEVICES, TEMPERATURE CONTROLS

(a) Space heating efficiency of combination heater(s), solar devices and temperature controls is to be assessed as in point 9;

(b) Solar device-assisted combination heaters, water heating efficiency

The 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

– $\eta_{wh+sol}$ is water heating efficiency of a package of combination heater with solar device, in %;

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

– $\eta_{wh}$ is energy efficiency of the combination water 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 point ( c) of this Annex.

## 11. 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 hot water storage tank 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 storage tanks used for solar devices 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:

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

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 4, and sanitary water inlet/outlet temperatures conditions stated in the table below

| sanitary water temperature regime for heat pump space heaters used as water heater | **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

## 12. SHOWER WATER HEAT RECOVERY DEVICE FACTOR

1) The efficiency of a shower water heat recovery device shall be established in accordance with the appropriate measurement methods in Annex IX, whereby the shower water flow rate and the incoming cold water flow rate are matched, the shower water flow rate has a temperature between 35 and 40°C and the incoming cold water a temperature of 10°C;
2) The shower water heat recovery device factor $f_{SWHRD,lp}$ is calculated for the declared load profile of the combination heater package as:

$$f_{WWHRD,lp} = \frac{1}{\left(1 - \left(\eta_{WWHRD,lp} * 0.64\right)\right)}$$

Where[10]:

- $\eta_{SWHRD,lp}$ is the shower water heat recovery device efficiency for the declared load profile, calculated in accordance with point 3).

3) The shower water heat recovery device efficiency for a load profile $\eta_{SWHRD,lp}$ is calculated as:

   a) If the shower water heat recovery device efficiency $\eta_i$ has been established at a flow rate $q_i$ equal to the load profile flow rate $q_{V,lp}$ the $\eta_{SWHRD,lp}$ for the declared load profile is the $\eta_i$ .

   b) If the shower water heat recovery device efficiency has been established at a flow rate of 12.5 l/min ($\eta_{12.5}$) and the applicable load profile flow rate $q_{V,lp}$ is lower, the $\eta_{SWHRD,lp}$ for the declared load profile is calculated as:

$$\eta_{WWHRD,lp} = \eta_{12.5} + \left(0.8 * 0.01 * (12.5 - q_{V,lp})\right)$$

   c) If the shower water heat recovery device efficiency has been established at two flow rates, one of which is 12.5 l/min ($\eta_{12.5}$) and the other is lower ($\eta_i$), and the applicable load profile flow rate $q_{V,lp}$ is below 12.5 l/min, the $\eta_{SWHRD,lp}$ for the declared load profile is calculated as:

$$\eta_{WWHRD,lp} = \eta_{12.5} + \left(0.8 * \frac{\eta_{12.5} - \eta_i}{q_{V,12.5} - q_{V,i}} * (q_{V,lp} - 12.5)\right)$$

   d) where:

   - $\eta_{12.5}$ is the shower water heat recovery device efficiency established in a test at a flow rate of 12.5 l/min;
   - $\eta_i$ is the shower water heat recovery device efficiency established in a test at a flow rate ‘’ other than 12.5 l/min;
   - $q_{12.5}$ is the water flow rate of 12.5 l/min used in the test;
   - $q_i$ is the water flow rate other than 12.5 l/min used in the test;
   - $q_{V,lp}$ is the applicable load profile flow rate according Table 1:

*Table 10. Load profile flow rate*

| **Load profile** | **3XS to XXS** | **XS** | **S** | **M** | **L** | **XL** | **XXL** | **3XL** | **4XL** |
|---|---|---|---|---|---|---|---|---|---|
| $q_{V,lp}$ (l/min) | (not applicable) | 3 | 5 | 6 | 8 | 8 | 12 | 48 | 96 |

4) The supplier of the package shall ensure that the sum (the combined volume flow rates) of the highest flow rates at which the SWHRDs supplied in the package have been tested exceeds the load profile flow rate for the water heater package as indicated in Table 1. The $\eta_{SWHRD,lp}$ for this package shall be the flow rate weighted average of the efficiencies established for the individual shower water heat recovery devices.

[10] The value of 0.64 represents the share of recoverable thermal energy from the reference energy Qref, taking into account various thermal losses and a suboptimal connection to heaters and taps.

## 13. 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 11.

*Table 11:*

**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 IX
** or lower if the unit cannot operate while fulfilling the other test conditions but as close as possible to 7°C

If the aforementioned heater cannot operate with the applicable settings, in the given temperatures, the heater shall be tested with a lower outdoor air temperature than +7°C, but as close as possible to +7°C until the settings of part load condition B apply. In this case, a penalty of 3 dB(A) will be added to the measured sound power level. The sound power level, including the penalty if applicable, shall meet the sound power level requirements in Annex II, section 3.

(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. The 3 dB(A) penalty is severe to induce manufacturers to realise the feasibility of the test condition.

## 14. CONTROLS VERIFICATION PROCEDURE

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 IX*

**Transitional Methods**

*Table 12*

**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 $\eta_u$ (=$\eta_4$ ) at rated heat output | § 3.1.6.1 Nominal output (definition);<br>§ 3.1.5.7 Useful efficiency (definition, symbol);<br>§ 9.2.2 (test); | useful output $P_N$ at 80 °C/60 °C stated by the manufacturer in kW.<br>Useful efficiency $\eta_u$ is the ratio of the useful output to the heat input in GCV, expressed as a %.<br>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 $\eta_1$ at 30 % part load and low temperature regime | § 3.1.6.2. Nominal condensing heat output at 50 °C/30 °C water temperature regime<br>§ 9.3.2. Useful efficiency at part load, Tests;<br>§ 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).<br>*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 $\eta_{son}$ and overall $\eta_s$ | § 9.4.6. $\eta_{son}$ definition<br>$\eta_{son} = 0{,}85\times \eta_1 + 0{,}15\times \eta_4$<br><br>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 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 |

***<u>Liquid fuel fired heating boilers</u>***

| ***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 $\eta_u$ (=$\eta_4$ ) at rated heat output | § 6.2. $P_N$ (= $P_4$) definition<br>§ 6.3. $\eta_u$ (=$\eta_4$) definition<br>annex A.10. Conversion NCV to GCV | as gas-fired boilers |
| Nominal condensing heat output at 30 % $P_N$ (= $P_1$) and useful efficiency $\eta_1$ at 30 % part load and low temperature regime | § 6.8. $\eta_1$ at 30% part load<br>§ 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 $\eta_{son}$ with test results for useful output P | § 6.10. $\eta_{son}$ definition<br>annex A.10<br><br>$\eta_{son} = 0{,}85\times \eta_1 + 0{,}15\times \eta_4$<br><br>also defines correction factors F(1), F(2), F(3) and F(4) | For B1 boiler testing see also<br>EN 303-1:2017. Part 1: Heating boilers with forced draught burners -- Terminology<br>EN 303-2:2017. Part 2: " -- Special requirements atomizing burners<br>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;***<br>§ 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:<br>See Annex VIII | |

**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 $\eta_u$ (=$\eta_4$ ) at rated heat output | § 3.7.4.3 Nominal heat output (in kW)<br>§ 6.6.1 Efficiency (definitions)<br>§ 7.6.1 Efficiency (test) | $P_N$ (= $P_4$) corresponds to $P_{th\ n}$ ;<br>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 $\eta_s$ 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 combi nation 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.<br>§6.5 DX-to-water(brine) and water(brine)-to-water(brine) units. Tables 12 and 14.<br><br>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.<br><br>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. $\eta_{s,h}=(1/CC)\times SCOP_{on} - \Sigma F(i)$<br>§7.3. $SCOP= Q_H/Q_{HE}$ where $Q_H$ is annual heat demand and $Q_{HE}$ is annual heating energy.<br>§7.4. $Q_H = P_{designh} \times H_{eH}$ where $P_{designh}$ is design heat load in kW and $H_{eH}$ is equivalent active mode hours.<br>§7.5. With hours (and measured power) for auxiliary and off modes the formula for $SCOP_{on}$ is complete | The equivalent active mode hours $H_{eH}$ are given in Annex B.<br><br>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.<br>$T_{hp,off}$ (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 .<br>Note that the active mode efficiency of the fuel boiler is $\eta_{son}$ (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.<br><br>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. |
| $P$ , $P$ , $P$ , $P$ | §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).<br>§5.2.2.2 Air-to-water(brine) units. Tables 8,9,10 (MT).<br>§5.2.3.2 water(brine)-to-water(brine) units. Tables 17,18,19 (LT)<br>§5.2.3.3 water(brine)-to-water(brine) units. Tables 20,21,22 (MT) | as EN 14825<br><br>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.<br>$SPER$=1/{$Prim_{gas}$/$SGUE$ +$Prim_{elec}$/SAEF}<br>$GUE$=Gas Utilisation Efficiency<br>$AEF$= Auxiliary Energy Factor<br>$Prim_{gas}$ = 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<br>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.<br><br>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:<br>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,<br>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).<br>§5.4.3 Air-to-water(brine) units. Tables 14,15, 16 (MT).<br>§5.5.2 water(brine)-to-water(brine) units. Tables 20,21,22 (LT)<br>§5.5.3 water(brine)-to-water(brine) units. Tables 23,24,25 (MT) | as EN 14825 |
| Seasonal Primary Energy Ratio SPER | §7.1<br>$SPER$=1/{$Prim_{gas}$/$SGUE$ +$Prim_{elec}$/SAEF}<br>$GUE$=Gas Utilisation Efficiency<br>$AEF$= Auxiliary Energy Factor<br>$Prim_{gas}$ = 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<br>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.<br><br>[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:<br>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.**<br>§7. Ecodesign Related Products Data ($\eta_{wh,}$, $Q_{fuel}$, $Q_{elec}$, $Q_{cor}$, *AFC, AEC, V40*)<br><br>EN 13203-1:2015. Gas fired domestic appliances producing hot water - Part 1: Assessment of performance of hot water deliveries.<br><br>*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**.<br>§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**.<br>§. TBW |
| | prEN 13203-6:2021. Gas-fired domestic appliances producing hot water - Part 6: Assessment of energy consumption of **adsorption and absorption heat pumps**.<br>§. 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**.<br>§. 6.3.2.2.1 Central heating input<br>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<br>§ TBW |
| | EN 16147:2017/FprA1:2020. **Heat pumps with electrically driven compressors** - Testing, performance rating and requirements for marking of domestic hot water units.<br>§7. Performance tests.<br>annex A. Load (tapping) profiles |
| | EN 50440:2015+A1:2020 Efficiency of domestic **electrical storage water heaters** and testing methods |

Note that the latter standard is not strictly for combination heaters (but for dedicated water heaters), but are shown here for lack of a better alternative.

| | |
|---|---|
| Shower water heat recovery device efficiency (%) | NEN 7120:2011/C2:2011<br>NTA8800:2020, Bijlage U<br>CSTB Protocole RECADO 2015<br><br>All three test standards may be accepted as method to determine shower shower heat recovery device efficiency, as long as the test conditions in ANNEX VIII, point 4 are met.<br>The efficiency to use in calculations should be determined using shower water flow rates equal or larger than the water flow rates shown in the table (combination of devices to achieve sufficient capacity is allowed) |

**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<br>EN 12897:2016+A1:2020 Clause 6.2.2 Annex B<br>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<br><br>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 $\eta_{wh+sol}$ | | |
| Solar-assisted heater space heating energy efficiency $\eta_{sh+sol}$ | | |
| Tank factor $f_{tank}$ | | |

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

*ANNEX X*

**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 VIII.

The Member State authorities shall only apply the verification tolerances that are set out in Table 8 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, $\eta_s$ | 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, $\eta_s$ | The determined value shall not be lower than the declared value by more than 8 %. |
| Water-heating energy efficiency, $\eta_{wh}$ | 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 %. |
| 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<br>— 0,3 W up to 10 W;<br>— 3 % for powers greater than 10 W |