WORKING DOCUMENT

COMMISSION REGULATION (EU) No …/..

implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air heating products, cooling products and high temperature chillers

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,

Whereas:

(1) Under Directive 2009/125/EC ecodesign requirements should be set by the Commission for energy-related products representing significant volumes of sales and trade, having a significant environmental impact and presenting significant potential for improvement through design in terms of their environmental impact without entailing excessive costs.

(2) Article 16(2)(a) of Directive 2009/125/EC provides, that in accordance with the procedure referred to in Article 19(3) and the criteria set out in Article 15(2), and after consulting the Ecodesign Consultation Forum, the Commission should, as appropriate, introduce implementing measures for products offering a high potential for cost-effective reduction of greenhouse gas emissions, such as for air heating products and cooling products.

(3) The Commission has carried out two preparatory studies covering the technical, environmental and economic aspects of air heating products and cooling products typically used in the Union. The studies were devised together with stakeholders and interested parties from the Union and third countries, and the results have been made publicly available.

(4) The environmental aspects of air heating products and cooling products that have been identified as significant for the purposes of this Regulation are energy consumption, noise and emissions of nitrogen oxides in the use phase.

(5) The preparatory studies show that requirements regarding the other ecodesign parameters referred to in Annex I, Part 1 to Directive 2009/125/EC are not necessary in the case of air heating products and cooling products.

(6) The scope of this Regulation should include air heating products, cooling products and high temperature process chillers designed to use gaseous fuels, liquid fuels or electricity.

[1] OJ L 285, 31.10.2009, p. 10.

(7) As refrigerants are addressed under Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases[2] no specific requirements on refrigerants are set in this Regulation. However, a bonus is proposed under the ecodesign requirements for space cooling products to steer the market towards the use of refrigerants with reduced harmful impact on the environment. The bonus will lead to lower minimum energy efficiency requirements for cooling products using low-global warming potential (GWP) refrigerants. In the case of high temperature process chillers, direct emissions account for not more of 2% of the combined direct and indirect emissions by high temperature process chillers covered by this Regulation, in consequence the use of a bonus is not proposed for high temperature process chillers. For space heating products (heat pumps) no bonus is considered for products using refrigerants with a GWP below 150, due to longer operating hours for heating products than for space cooling products, a small bonus of 5% would result in overall greenhouse gas emissions that exceed those of products that do not use a bonus.

(8) Annual energy consumption related to air heating products, cooling products and high temperature process chillers was estimated to have been 2 477 PJ (59 Mtoe) in the European Union in 2010 corresponding to 107 Mt CO_2 emissions. Unless specific measures are taken, annual energy consumption related to local space heaters is expected to be 2 655 PJ (63 Mtoe) in 2020 and 2 534 PJ (60 Mtoe) for 2030.

(9) The energy consumption of air heating products, cooling products and high temperature process chillers can be reduced by applying existing, non-proprietary technologies without the increase of the combined costs of purchasing and operating these products.

(10) Annual emissions of nitrogen oxides, primarily emitted by gas fired warm air heaters, expressed as contribution to acidification (SO_x equivalent) have been estimated to have been 36 Mt SO_x equivalent/year in the European Union in 2010. These emissions are expected to be reduced to 29 Mt SO_x equivalent/year in 2020 and 22 Mt for 2030.

(11) The emissions of air heating products, cooling products and high temperature process chillers can be further reduced by applying existing, non-proprietary technologies without the increase of the combined costs of purchasing and operating these products.

(12) The effect of the ecodesign requirements set out in this Regulation is expected to result by 2020 in estimated annual energy savings of about 100 PJ (3.6 Mtoe), with related emission reduction of CO_2 of 2 Mt emissions. Furthermore, taking into account the lifetime of the product and the replacement of the stock, it is estimated that in the year 2030 the annual savings will be approximately 206 PJ (5 Mtoe) corresponding to 7.3 Mt CO_2.

(13) The effect of the ecodesign requirements set out in this Regulation is expected to result by 2020 in a reduction of nitrogen oxide emissions of 0.7 Mt SO_x equivalent/year by 2020 and 2.2 Mt SOx equivalent/year by 2030.

(14) This Regulation covers products with different technical characteristics. If the same efficiency requirements were set on them certain technologies would be banned from the market, which would result in a negative impact for consumers. For this reason ecodesign requirements relative to the potential of each technology create a level playing field in the market.

[2] OJ L 161, 14.6.2006, p. 1.

(15) Ecodesign requirements should harmonise energy consumption, noise and nitrogen oxides emission requirements for air heating products and cooling products throughout the Union, thus helping to make the internal market operate better and to improve the environmental performance of these products.

(16) The ecodesign requirements should not affect the functionality or affordability of air heating products and cooling products from the end-user's perspective and should not negatively affect health, safety or the environment.

(17) The ecodesign requirements should be introduced taking into account a sufficient timeframe for the manufacturers to redesign their products subject to this Regulation. The timing should be such that cost impact for manufacturers, in particular for small and medium-sized enterprises, is taken into account, while ensuring timely achievement of the objectives of this Regulation.

(18) Measurements of the relevant product parameters should be performed through reliable, accurate and reproducible measurement methods, which take into account the recognised state of the art measurement methods including, where available, harmonised standards adopted by the European standardisation organisations, as listed in Annex I to Regulation (EU) 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation[3].

(19) In accordance with Article 8(2) of Directive 2009/125/EC, this Regulation specifies which conformity assessment procedures apply.

(20) To facilitate compliance checks, manufacturers should provide information in the technical documentation referred to in Annexes IV and V to Directive 2009/125/EC insofar as that information relates to the requirements laid down in this Regulation.

(21) To further limit the environmental impact of air heating products and cooling products manufacturers should provide information on disassembly, recycling and/or disposal.

(22) In addition to the legally binding requirements laid down in this Regulation, indicative benchmarks for best available technologies should be identified to ensure that information on the life-cycle environmental performance of space heaters and combination heaters is widely available and easily accessible.

(23) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 19(1) of Directive 2009/125/EC,

HAS ADOPTED THIS REGULATION:

Article 1

Subject matter and scope

1) This Regulation This Regulation establishes ecodesign requirements for the placing on the market and/or putting into service of:

   a) air heating products, with a rated heating capacity not exceeding 1 MW,

   b) cooling products with a rated cooling capacity not exceeding 2 MW.

   c) fan coil units;

   d) high temperature process chillers.

[3] OJ L 316, 14.11.2012, p. 12.

2) This Regulation shall not apply to products meeting at least one of the following criteria:

a) products covered under the scope of Regulation *[number and footnote to be inserted after publication in the OJEU]*[4] ecodesign requirements of local space heaters;

b) products covered under the scope of Regulation No 206/2011[5] on ecodesign requirements for room air conditioners and comfort fans;

c) comfort chillers and high temperature process chillers with leaving chilled water temperatures of less than +2ºC;

d) products designed for using predominantly biomass fuels;

e) products using solid fuels;

f) products that supply heat or cold in combination with electric power ('cogeneration') as a result of a fuel combustion or conversion process;

g) products within the scope of Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control)[6];

h) high temperature process chillers exclusively using evaporative condensing;

i) custom-made high temperature process chillers assembled on site, made on a one-off basis;

j) high temperature process chillers in which refrigeration is effected by an absorption process using heat as the energy source;

k) air heating and/or cooling products of which the primary function is the purpose of storing and merchandising perishable materials at specified temperatures by commercial, institutional or industrial facilities and of which space heating and/or space cooling is a secondary function and:

i) which are covered under the scope of Regulation [*number and footnote to be inserted after publication in the OJEU*] ecodesign requirements for condensing units];

ii) the energy efficiency of the space heating and/or space cooling function is dependent on that of the primary function.

Article 2

Definitions

In addition to the definitions set out in Directive 2009/125/EC, the following definitions shall apply:

1) 'air heating product' means a device that:

a) incorporates or provides heat to an air-based heating system,

b) is equipped with one or more heat generators;

A heat generator designed for an air heating product and an air heating product housing to be equipped with such heat generator shall be considered an air heating product.

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4 *[To be inserted after publication]*

5 OJ L 72, 10.3.2012, p. 7.

6 OJ L 334, 17.12.2010, p. 17.

2) ‘air-based heating system’ means the components and/or equipment necessary for the distribution of heated air, by means of an air moving device, either through ducting or directly into the heated space, in order to attain and maintain the desired indoor temperature of an enclosed space, such as a building or parts thereof for thermal comfort of human beings;

3) ‘heat generator’ means the part of an air heating product that generates useful heat using one or more of the following processes:

   a) the combustion of liquid or gaseous fuels;

   b) the Joule effect in electric resistance heating elements;

   c) by capture heat from ambient air, water or ground heat source(s) and transferring this heat to the air-based heating system using a vapour compression cycle or a sorption cycle.

4) ‘cooling product’ means a device that:

   a) incorporates, or provides chilled air or water to, an air-based cooling system or water-based cooling system, and

   b) is equipped with one or more cold generator(s);

   A cold generator designed for a cooling product and an cooling product housing to be equipped with such cold generator shall be considered an cooling product;

5) ‘air-based cooling system’ means the components or equipment necessary for the distribution of chilled air, through ducting or local cooling of air, in order to attain and maintain the desired indoor temperature of an enclosed space, such as a building or parts thereof, for thermal comfort of human beings;

6) ‘water-based cooling system’ means the components or equipment necessary for the distribution of chilled water and heat transfer of heat from indoor spaces to cold water, in order to attain and maintain the desired indoor temperature of an enclosed space, such as a building or parts thereof, for thermal comfort of human beings;

7) ‘cold generator’ means the part of a cooling product that generates a temperature difference allowing heat to be extracted from the heat source, being the indoor space to be cooled, and transferred to a heat sink, such as ambient air, water or ground, using a vapour compression cycle or a sorption cycle;

8) ‘comfort chiller’ means an cooling product that:

   a) of which the indoor heat exchanger (evaporator) extracts heat from a water-based cooling system (heat source), designed to operate at leaving chilled water temperatures between + 2°C and + 15°C;

   b) has a cold generator,

   c) of which the outdoor heat exchanger (condenser) releases this heat to ambient air, water or ground heat sink(s);

   d) may or may not operate in reverse.

9) ‘fan coil unit’ means a factory-made assembly which provides one or more of the functions of forced circulation of air, for the purpose of heating, cooling, dehumidification and filtering of indoor air thermal comfort of human beings, but which does not include the heat or cold generator nor an outdoor heat exchanger. The device may be equipped with minimal ductwork to guide the intake and exit of (conditioned) air. The product may

be designed for built in application, or with an enclosure for application within the conditioned space;

10) 'high temperature process chiller' means a product:

a) integrating at least one compressor, driven or intended to be driven by an electric motor, and one evaporator ;

b) capable of cooling down and continuously maintaining the temperature of a liquid in order to provide cooling to a refrigerated appliance or system, the purpose of which is not to provide in space cooling for thermal comfort of human beings;

c) is capable of delivering its rated refrigeration capacity , at an indoor heat exchanger outlet temperature of 7°C, at standard rating conditions;

d) it may or may not integrate the condenser, the coolant circuit hardware and other ancillary equipment.

11) 'rated refrigeration capacity' (P_A) means the refrigeration capacity which the high temperature process chiller is capable to reach, when operating at full load, and measured at rating point 'A' of part load conditions defined for air-cooled or water-cooled high temperature process chillers, expressed in kW.

12) 'biomass fuel' means a gaseous or liquid fuel produced from biomass;

13) '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;

14) 'fossil fuel' means a gaseous or liquid fuel of fossil origin;

15) 'solid fuel' means a fuel which is solid at normal indoor room temperatures, including biomass and fossil fuel;

16) 'rated heating capacity' means the heating capacity of a heat pump when providing space heating at 'standard rating conditions'($P_{rated,h}$), or the maximum (nominal) heat output (P_{nom}) of a warm air heater, expressed in kW;

17) 'rated cooling capacity' ($P_{rated,c}$) means the cooling capacity of a comfort chiller and/or air conditioner when providing space cooling at 'standard rating conditions', expressed in kW;

18) 'standard rating conditions' means the operating conditions of comfort chillers, air conditioners and heat pumps while establishing the rated heating capacity , rated cooling capacity, sound power level and emissions of nitrogen oxides (for products using internal combustion following engine rpm equivalent);

19) 'leaving chilled water temperature' means the temperature of the water leaving the chiller, expressed in degree Celsius;

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

Article 3

Ecodesign requirements and timetable

1) The ecodesign requirements for air heating products, cooling products, fan coil units and high temperature chillers are set out in Annex II.

2) Each ecodesign requirement shall apply in accordance with the following timetable:

a) From 1 January 2017:

i) air heating products shall correspond to requirements as indicated in Annex II, point1) a) and 6);

ii) cooling products shall correspond to requirements as indicated in Annex II, point 2) a) and 6);

iii) fan coil units shall correspond to requirements as indicated in Annex II, point 6);

iv) high temperature process chillers shall correspond to the requirements as indicated in Annex II, point 3) a) and 6);

v) air heating products, cooling products and high temperature process chillers shall correspond to the requirements as indicated in Annex II, point 5) a);

c) From 1 January 2020:

i) air heating products shall correspond to requirements as indicated in Annex II, point 1) b);

ii) cooling products shall correspond to requirements as indicated in Annex II, point 2) b);

iii) high temperature process chillers shall correspond to the requirements as indicated in Annex II point 3) b);

iv) air heating products, cooling products and high temperature process chillers shall correspond to the requirements as indicated in Annex II, point 5) b).

3) Compliance with ecodesign requirements shall be measured and calculated in accordance with requirements set out in Annex III.

Article 4

Conformity assessment

The conformity assessment procedure referred to in Article 8(2) of Directive 2009/125/EC shall be the internal design control set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.

For the purposes of conformity assessment, the technical documentation shall contain the information set out in point 6 of Annex II to this Regulation.

Article 5

Verification procedure for market surveillance purposes

Member States shall apply the verification procedure set out in Annex IV to this Regulation when performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC for compliance with requirements set out in Annex II to this Regulation.

Article 6

Benchmarks

The indicative benchmarks for best-performing air heating products, cooling products and high temperature process chillers available on the market at the time of entry into force of this Regulation are set out in Annex V.

Article 7

Review

The Commission shall review this Regulation in the light of technological progress of air heating products, cooling products and high temperature process chillers and present the result of this review to the Ecodesign Consultation Forum no later than 1 January 2021. In particular, the review shall include an assessment of the following aspects:

1) the appropriateness of setting ecodesign requirements covering direct greenhouse gas emissions related to refrigerants;
2) the appropriateness of setting stricter ecodesign requirements for energy efficiency of air heating products and cooling products and high temperature process chillers, for sound power level and for emissions of nitrogen oxides;
3) the appropriateness of setting emission requirements on the basis of useful heating or cooling output, instead of energy input;
4) for all products, the value of the tolerances for verification as mentioned in the verification procedures set out in Annex IV

Article 8

Derogation

1) Until 1 January 2017 Member States may allow the placing on the market and/or putting into service of air heating products and cooling products, which are in conformity with the national provisions on seasonal energy efficiency in force upon adoption of this Regulation;
2) Until 1 January 2017 Member States may allow the placing on the market and/or putting into service of high temperature process chillers, which are in conformity with the national provisions on seasonal energy performance ratio in force upon adoption of this Regulation;
3) Until 1 January 2017 Member States may allow the placing on the market and/or putting into service of air heating products, heat pump heaters, comfort chillers and air conditioners, which are in conformity with the national provisions on emissions of nitrogen oxides in force upon adoption of this Regulation.

Article 9

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*.

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

Done at Brussels,

For the Commission
The President
José Manuel BARROSO

Annex I

Definitions applicable for Annexes II to VII

In addition to the definitions set out in Directive 2009/125/EC, the following definitions shall apply:

Common definitions:

1) 'conversion coefficient' (CC) means a coefficient reflecting the estimated 40 % average EU generation efficiency, as established in Annex IV of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency[7]; the value of the conversion coefficient shall be CC = 2,5;

2) '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 heat of condensation of any water vapour contained in the fuel and of the water vapour formed by the combustion of any hydrogen contained in the fuel;

3) 'global warming potential' (GWP) means the measure of how much 1 kg of the refrigerant applied in the vapour compression cycle is estimated to contribute to global warming, expressed in kg CO_2 equivalents over a 100-year time horizon;

   GWP values considered will be those set out in Annex I and II to Regulation (EC) No 517/2014[8];

   for non-fluorinated gases, the GWP values are those published in the first IPCC assessment over a 100-year period[9];

   GWP values for mixtures of refrigerants shall be based on the formula stated in Annex IV of the Regulation 517/2014;

   for refrigerants not included in the above references, the Report of the 2010 Assessment of the Montreal Protocol Scientific Assessment Panel[10] (SAP) and the IPCC UNEP 2010 report on Refrigeration, Air Conditioning and Heat Pumps, dated February 2011[11], or newer, shall be used as reference;

4) 'nominal air flow rate' means the air flow rate in m^3/h measured at the air outlet of indoor and/or outdoor units (if applicable) of chillers, air conditioners or heat pumps, and fan coils at standard rating conditions for cooling, or heating if the product has no cooling function;

5) 'sound power level' (L_{WA}) means the A-weighted sound power level measured indoors and/or outdoors, at standard rating conditions, and expressed in dB;

6) 'supplementary heater' means a heat generator of the air heating product that generates supplemental heat during conditions the heating load exceeds the heating capacity of the preferred heat generator;

7) 'preferred heat generator' means the heat generator of the air heating product that has the highest contribution in the total heat supplied over the heating season;

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7 OJ L 315, 14.11.2012, p.1.

8 OJ L 150, 20.5.2014, p. 217.

9 Climate Change, The IPCC Scientific Assessment, J.T Houghton, G.J.Jenkins, J.J. Ephraums (ed.) Cambridge University Press, Cambridge (UK) 1990.

10 http://ozone.unep.org/Assessment_Panels/SAP/Scientific_Assessment_2010/index.shtml

11 http://ozone.unep.org/teap/Reports/RTOC/

8) ‘seasonal space heating energy efficiency’ ($\eta_{s,h}$) means the ratio between the reference annual heating demand pertaining to a designated heating season provided by an air heating product, and the annual energy consumption for heating, corrected by contributions accounting for temperature control and the electricity consumption of ground water pump(s), expressed in %;

9) ‘seasonal space cooling energy efficiency’ ($\eta_{s,c}$) means the ratio between the reference annual cooling demand pertaining to a designated cooling season provided by a cooling product, and the annual energy consumption for cooling, corrected by contributions accounting for temperature control and the electricity consumption of ground water pump(s), expressed in %;

10) ‘temperature control’ means equipment that interfaces with the end-user regarding the values and timing of desired indoor temperature and communicates relevant data, such as actual indoor and/or outdoor temperature(s), to an interface of the product such as a central processing unit, thus contributing to the regulation of the indoor temperature(s);

11) ‘bin’ (bin_j) means a combination of an ‘outdoor temperature (T_j)’ and ‘bin hours (h_j)’, as set out in Annex III, Table 25;

12) ‘bin hours’ (h_j) means the hours per season, expressed in hours per year, at which an outdoor temperature occurs for each bin, as set out in Annex III, Table 25;

13) ‘indoor temperature’ (T_{in}) means the dry bulb indoor air temperature, expressed in degrees Celsius;the relative humidity may be indicated by a corresponding wet bulb temperature;

14) ‘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;

15) ‘capacity control’ means the ability of a process chiller to change its cooling capacity by changing the volumetric flow rate of the refrigerant(s), to be indicated as ‘fixed’ if the volumetric flow rate cannot be changed, 'staged' if the volumetric flow rate is changed or varied in series of not more than two steps, or ‘variable’ if the volumetric flow rate is changed or varied in series of three or more steps.

16) 'nitrogen oxide emissions' means the emissions of the sum of nitrogen monoxide and nitrogen dioxide by air heating products or cooling products using gaseous or liquid fuels, and expressed in nitrogen dioxide, established while providing the rated heating capacity, expressed in mg/kWh in terms of GCV;

Definitions related to warm air heaters:

17) ‘warm air heater’ means an air heating product that transfers the heat from a heat generator using the combustion of gaseous or liquid fuels, the Joule effect in electric resistance heating only, directly to air and incorporates or distributes this heat through an air-based heating system.

18) ‘warm air heater using gaseous/liquid fuels’ means a warm air heater that uses a heat generator using the combustion of gaseous or liquid fuels;

19) ‘warm air heater using electricity’ means a warm air heater that uses a heat generator using the Joule effect in resistance heating;

20) ‘minimum capacity’ means the minimum heating capacity of the warm air heater (P_{min}), expressed in kW;

21) ‘useful efficiency at rated heating capacity’ ($\eta_{\_nom}$) means the ratio of the rated heating capacity and the total energy input to achieve this heating capacity, expressed in %, whereby the total energy input is based on the GCV of the fuel if using gaseous/liquid fuels;

22) ‘useful efficiency at minimum capacity’ ($\eta_{\_pl}$) means the ratio of the minimum capacity and the total energy input to achieve this heating capacity, expressed in %, whereby the total energy input is based on the GCV of the fuel;

23) ‘seasonal space heating energy efficiency in active mode’ ($\eta_{s,on}$) means a weighted average of the useful efficiency at rated heating capacity, and of the useful efficiency at minimum capacity, including consideration of the envelope losses, plus the emission efficiency, expressed in %;

24) ‘envelope losses’ means the losses in seasonal space heating energy efficiency due to heat loss of the heat generator to areas outside the space to be heated, expressed in %;

25) ‘auxiliary electricity consumption’ means the losses in seasonal space heating energy efficiency due to electric power consumption at rated heating capacity (el_{max}), at minimum capacity (el_{min}) and in standby mode (el_{sb});

26) ‘pilot flame losses’ means the losses in seasonal space heating energy efficiency caused by the ignition burner power consumption;

27) ‘ignition burner power consumption’ (P_{ign}) means the power consumption of a burner intended to ignite the main burner and that can only be extinguished by intervention of the user, expressed in W based on the GCV of the fuel;

28) ‘vented flue losses’ means the losses in seasonal space heating energy efficiency during periods the main heat generator is not active, expressed in %;

Definitions of heat pumps, air conditioners and comfort chillers:

25) ‘heat pump’ means an air heating product:

a) of which the outdoor heat exchanger (evaporator) extracts heat from ambient air, water, or ground heat sources,

b) which has a heat generator that uses a vapour compression cycle or a sorption cycle,

c) of which the indoor heat exchanger (condenser) releases this heat to an air-based heating system,

d) which may be equipped with a supplementary heater;

e) which may operate in reverse in which case it may be considered an air conditioner;

26) ‘air-to-air heat pump’ means a heat pump which has a heat generator that uses a vapour compression cycle driven by an electric motor or internal combustion engine and whereby the outdoor heat exchanger (evaporator) allows heat transfer from ambient air;

27) ‘water/brine-to-air heat pump’ means a heat pump which has a heat generator that uses a vapour compression cycle driven by an electric motor or internal combustion engine and whereby the outdoor heat exchanger (condenser) allows heat transfer from water or brine;

28) ‘rooftop heat pump’ means a heat pump, driven by an electric compressor, of which the evaporator, compressor and condenser are integrated into a single package;

29) ‘sorption cycle heat pump’ means a heat pump which has a heat generator that uses a sorption cycle relying on external combustion of fuels and/or a heat driven process;

29) ‘air conditioner’ means a cooling product that provides in space cooling and:

a) of which the indoor heat exchanger (evaporator) extracts heat from an air-based cooling system (heat source),

b) which has a cold generator that uses a vapour compression cycle or a sorption cycle,

c) of which the outdoor heat exchanger (condenser) releases this heat to ambient air, water or ground heat sink(s) and which may or may not include heat transfer that is based on evaporation of externally added water;

d) may operate in reverse in which case it may be considered a heat pump.

30) ‘air-to-air air conditioner’ means an air conditioner which has a cold generator that uses a vapour compression cycle driven by an electric motor or internal combustion engine and whereby the outdoor heat exchanger (condenser) allows heat transfer to air;

31) ‘water/brine-to-air air conditioner’ means an air conditioner which has a cold generator that uses a vapour compression cycle driven by an electric motor or internal combustion engine and whereby the outdoor heat exchanger (condenser) allows heat transfer to water or brine;

32) ‘rooftop air conditioner’ means an air conditioner, driven by an electric compressor, of which the evaporator, compressor and condenser are integrated into a single package;

33) ‘sorption cycle air conditioner’ means an air conditioner which has a cold generator that uses a sorption cycle relying on external combustion of fuels and/or a heat driven process;

34) ‘air-to-water chiller’ means a comfort chiller that has a cold generator that uses a vapour compression cycle driven by an electric motor or internal combustion engine and whereby the outdoor heat exchanger (condenser) of the cold generator allows heat transfer to air, including heat transfer that is based on evaporation into this air of externally added water;

35) ‘water/brine-to-water chiller’ means a comfort chiller that has a cold generator that uses a vapour compression cycle driven by an electric motor or internal combustion engine and whereby the condenser of the cold generator allows heat transfer to water or brine, excluding heat transfer that is based on evaporation of externally added water;

Definitions related to the calculation method for comfort chillers, air conditioners and heat pumps

36) ‘reference design conditions’ means the combination of the ‘reference design temperature’, the maximum ‘bivalent temperature’ and the maximum ‘operation limit temperature’, as set out in Annex III, Table 24;

33) ‘reference design temperature’ means the ‘outdoor temperature’ for either cooling ($T_{design,c}$) or heating ($T_{design,h}$) as described in Annex III, Table 24, at which the ‘part load ratio’ is equal to 1 and which varies according to the designated cooling or heating season, expressed in degrees Celsius;

34) ‘bivalent temperature’ (T_{biv}) means the outdoor temperature (T_j) declared by the manufacturer at which the declared heating output (vapour compression cycle only) equals the part load for heating and below which the declared capacity heating has to be supplemented with electric back up heater capacity in order to meet the part load for heating, expressed in degrees Celsius;

35) ‘operation limit temperature’ (T_{ol}) means the outdoor temperature declared by the manufacturer for heating, below which the heat pump will not be able to deliver any

heating capacity and the declared heating capacity is equal to zero, expressed in degrees Celsius;

36) 'part load ratio' ($pl(T_j)$) means the 'outdoor temperature' minus 16ºC, divided by the 'reference design temperature' minus 16ºC, for either space cooling or space heating;

37) 'season' means a set of ambient conditions, designated as either the average/colder/warmer cooling season or average heating season, describing per bin the combination of outdoor temperatures and bin hours pertaining to that season;

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

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

40) 'seasonal energy efficiency ratio' (SEER) is the overall energy efficiency ratio of the air conditioner or chiller, representative for the whole cooling season, calculated as the 'reference annual cooling demand' divided by the 'annual electricity consumption for cooling';

41) 'seasonal coefficient of performance' (SCOP) is the overall coefficient of performance of a heat pump using electricity, representative of the designated heating season, calculated as the reference annual heating demand divided by the reference annual energy consumption for heating;

42) 'reference annual cooling demand' (Q_C) means the reference cooling demand, and pertaining to a designated cooling 'season', to be used as basis for calculation of SEER and calculated as the product of the design load for cooling ($P_{designc}$) and the equivalent active mode hours for cooling (H_{CE}), expressed in kWh;

43) 'reference annual heating demand' (Q_H) means the reference heating demand pertaining to a designated heating season, to be used as basis for calculation of and calculated as the product of the design load for heating ($P_{designh}$) and the annual equivalent active mode hours (H_{HE}), expressed in kWh;

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

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

46) 'equivalent active mode hours for cooling' (H_{CE}) means the assumed annual number of hours the unit must provide the 'design load for cooling' ($P_{designc}$) in order to satisfy the 'reference annual cooling demand', expressed in hours;

47) ‘equivalent active mode hours for heating’ (H_{HE}) means the assumed annual number of hours a heat pump air heater has to provide the design load for heating to satisfy the reference annual heating demand, expressed in hours;

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

49) ‘active mode seasonal coefficient of performance’ ($SCOP_{on}$) means the average coefficient of performance of the heat pump in active mode, for the designated heating season, constructed from the part load, electric back up heating capacity (where required) and bin-specific coefficients of performance ($COP_{bin}(T_j)$) and weighted by the bin hours the bin condition occurs;

50) ‘bin-specific coefficient of performance’ ($COP_{bin}(T_j)$) means the coefficient of performance of the heat pump for every bin j with outdoor temperature T_j in a season, derived from the part load, declared capacity and declared coefficient of performance ($COP_d(T_j)$) for specified bins (j) and calculated for other bins through inter/extrapolation, when necessary corrected by the applicable degradation coefficient;

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

52) ‘declared heating capacity’ ($Pdh(T_j)$) means the heating capacity of the vapour compression cycle of a heat pump, pertaining to an outdoor temperature T_j and indoor temperature (T_{in}), as declared by the manufacturer, expressed in kW;

53) ‘declared cooling capacity ’ ($Pdc(T_j)$) means the cooling capacity of the vapour compression cycle of the air conditioner or chiller, pertaining to an outdoor temperature T_j and indoor temperature (T_{in}), as declared by the manufacturer, expressed in kW

54) ‘design load for heating’ ($P_{designh}$) means heating load applied to a heat pump at the reference design temperature, whereby the design load for heating $P_{designh}$ is equal to the part load for heating with outdoor temperature T_j equal to reference design temperature $T_{designh}$, expressed in kW;

55) ‘design load for cooling’ ($P_{designc}$) means the cooling load applied to a chiller or air conditioner at the reference design temperature, whereby the design load for cooling $P_{designc}$ is equal to declared cooling capacity at outdoor temperature T_j equal to reference design temperature for cooling $T_{designc}$, expressed in kW

56) ‘declared coefficient of performance’ ($COP_d(T_j)$) means the coefficient of performance at a limited number of specified bins (j) with outdoor temperature (Tj);

57) ‘declared energy efficiency ratio’ ($EER_d(T_j)$ means the energy efficiency ratio at a limited number of specified bins (j) with outdoor temperature (T_j);

58) ‘degradation coefficient’ (Cd or Cc) means the measure of efficiency loss due to cycling of an air conditioner or heat pump; if Cd/Cc is not determined by measurement then the default degradation coefficient shall be Cd = 0,25 for an air conditioner or heat pump, or Cc = 0.9 for a comfort or high temperature process chiller;

59) ‘electric back-up heating capacity’ (elbu(T_j)) is the heating capacity of a real or assumed electric back-up heater with COP of 1 that supplements the declared heating capacity (Pdh(T_j)) in order to meet the part load for heating (Ph(T_j)) in case Pdh(T_j) is less than Ph(T_j), for the outdoor temperature (T_j), expressed in kW;

60) ‘system capacity ratio’ means the ratio of the total declared cooling or heating capacity of all operating indoor units to the declared cooling or heating capacity of the outdoor unit(s) at standard rating conditions;

61) ‘capacity ratio’ means the part load for heating $P_{H(Tj)}$ divided by the declared heating capacity $P_{dh(Tj)}$ or the part load for cooling $P_{C(Tj)}$ divided by the declared cooling capacity $P_{dc(Tj)}$;

Operating modes for calculation of seasonal space heating or cooling energy efficiency of comfort chillers, air conditioners and air heating products:

62) ‘active mode’ means the mode corresponding to the hours with a cooling or heating load of the building and whereby the cooling or heating function of the unit is activated. This condition may involve on/off-cycling of the unit in order to reach or maintain a required indoor air temperature;

63) ‘standby mode’ means a condition where the warm air heater, chiller, air conditioner or heat pump 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;

64) ‘reactivation function’ means a function facilitating the activation of other modes, including active mode, by remote switch including remote control, internal sensor, timer to a condition providing additional functions, including the main function;

65) ‘information or status display’ is a continuous function providing information or indicating the status of the equipment on a display, including clocks;

66) ‘off mode’ means a condition in which the chiller, air conditioner or heat pump is connected to the mains power source and is not providing any function. Also considered as 'off mode' are conditions providing only an indication of 'off mode' condition, as well as conditions providing only functionalities intended to ensure electromagnetic compatibility pursuant to Directive 2004/108/EC of the European Parliament and of the Council[12];

67) ‘thermostat-off mode’ means the condition corresponding to the hours with no cooling or heating load, whereby the cooling or heating function is switched on but the unit is not operational; cycling in active mode is not considered as thermostat-off mode;

68) ‘crankcase heater mode’ means the condition in which the unit has activated a heating device to avoid the refrigerant migrating to the compressor to limit the refrigerant concentration in oil at compressor start;

69) ‘off mode power consumption’ (P_{OFF}) means the power consumption of unit in off mode, expressed in kW;

70) ‘thermostat-off mode power consumption’ (P_{TO}) means the power consumption of the unit while in thermostat-off mode, expressed in kW;

[12] OJ L 390, 31.12.2004, p.24.

71) ‘standby mode power consumption’ (P_{SB}) means the power consumption of the unit while in standby mode, expressed in kW;

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

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

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

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

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

Definitions related to the calculation method for internal combustion air conditioners and heat pumps

77) ‘seasonal primary energy ratio for cooling’ ($SPER_c$) means the overall energy efficiency ratio of the air conditioner or chiller, representative for the designated cooling season;

78) 'seasonal gas utilization efficiency in cooling mode' ($SGUE_c$) means the gas utilization efficiency for the whole cooling season;

79) 'cooling load' ($P_{c(Tj)}$) means the cooling load applied to the unit at bin at outdoor temperature Tj, calculated as the 'design cooling load' ($P_{designc}$) multiplied by the part load ratio (plr(Tj)), expressed in kW;

80) 'design cooling load' ($P_{designc}$) is the cooling capacity at reference design conditions and equal to the rated cooling capacity (P_{ratedc}) at standard rating conditions, expressed in kW;

81) 'gas utilization efficiency at partial load' means the gas utilization efficiency when cooling (GUE_{cPL}) or heating (GUE_{hPL}) at outdoor temperature Tj;

82) 'gas utilization efficiency at declared capacity' means the gas utilization efficiency when cooling (GUE_{cDC}) or heating (GUE_{hDC}) at part load conditions as defined in Annex III, Table 21, and corrected for possible cycling behaviour of the unit, in case the effective cooling capacity (Q_{Ec}) exceeds the cooling load ($P_{c(Tj)}$) or the effective heating capacity (Q_{Ec}) exceeds the heating load ($P_{h(Tj)}$);

83) 'effective cooling capacity' (Q_{Ec}) means the measured cooling capacity corrected for the heat from the device (pump(s) or fan(s)) responsible for circulating the heat transfer medium through the indoor heat exchanger;

84) 'effective heat recovery capacity' (Q_{Ehr}) means the measured heat recovery capacity corrected for the heat from the device (pump(s)) of the heat recovery circuit;

85) 'measured heat input for cooling' (Q_{gmc}) means the measured fuel input at part load conditions as defined in Annex III, Table 21;

86) 'seasonal auxiliary energy factor in cooling mode' ($SAEF_c$) means the auxiliary energy efficiency for the designated cooling season, including the contribution of low power modes;

87) 'reference annual cooling demand' (Q_{refc}) means the annual cooling demand, calculated as the design cooling load multiplied by the equivalent active mode hours for cooling (H_{EC});

88) 'seasonal auxiliary energy factor in cooling mode in active mode' ($SAEF_{con}$) means the the auxiliary energy efficiency for the designated cooling season, excluding the contribution of low power modes;

89) 'auxiliary energy factor in cooling mode at partial load' (AEF_{cPL}) means the auxiliary energy efficiency when cooling at outdoor temperature Tj;

90) 'electric power input in cooling mode' (P_{Ec}) means the effective cooling electrical power input, in kW;

91) 'seasonal primary energy ratio for heating' ($SPER_h$) means the overall energy efficiency ratio of the heat pump, representative for the designated heating season;

92) 'seasonal gas utilization efficiency in heating mode' ($SGUE_h$) means the gas utilization efficiency for the designated heating season;

93) 'heating load' ($P_{h(Tj)}$) means the heating load applied to the unit at bin at outdoor temperature Tj, calculated as the 'design heating load' ($P_{designh}$) multiplied by the part load ratio (plr(Tj)), expressed in kW;

94) 'design heating load' ($P_{designh}$) is the heating capacity at reference design conditions and is equal to the rated heating capacity (P_{ratedh}) at standard rating conditions, expressed in kW;

95) 'effective cooling capacity' (Q_{Eh}) means the measured heating capacity corrected for the heat from the device (pump(s) or fan(s)) responsible for circulating the heat transfer medium through the indoor heat exchanger;

96) 'measured heat input for heating' (Qgmh) means the measured fuel input at part load conditions as defined in Annex III Table 21;

97) 'seasonal auxiliary energy factor in heating mode' ($SAEF_h$) means the auxiliary energy efficiency for the designated heating season, including the contribution of low power modes;

98) 'reference annual heating demand' (Q_{refh}) means the annual heating demand, calculated as the design heating load multiplied by the annual equivalent heating hours;

99) 'seasonal auxiliary energy factor in heating mode in active mode' ($SAEF_{hon}$) means the the auxiliary energy efficiency for the designated heating season, excluding the contribution of low power modes;

100) 'auxiliary energy factor in heating mode at partial load' (AEF_{hPL}) means the auxiliary energy efficiency when heating at outdoor temperature Tj;

101) 'electric power input in heating mode' (P_{Eh}) means the effective heating electrical power input, in kW;

102) 'NOx emissions of heat pumps and air conditioners with an internal combustion engine' means the emissions of the sum of nitrogen monoxide and nitrogen dioxide emissions, of heat pumps and air conditioners with an internal combustion engine, measured at standard rating conditions, using engine rpm equivalent, expressed in mg nitrogen dioxide per kWh fuel input in terms of GCV;

103) 'engine rpm equivalent' ($Erpm_{equivalent}$) means the revolutions per minute of the internal combustion engine calculated on the basis of a engine rpm at 70, 60, 40 and 20 % part load ratios for heating and weighing factors of 0.15, 0.25, 0.30 and 0.30 respectively;

Definitions related to high temperature process chillers

104) ‘air-cooled high temperature process chiller’ means a high temperature process chiller, the evaporator of which transfers heat to ambient air;

105) ‘water-cooled high temperature process chiller’ means a high temperature process chiller, the evaporator of which transfers heat to water or ground;

106) ‘rated power input’ (D_A) means the electrical power input which is needed by the high temperature process chiller (including the compressor, the condenser fan(s) or pumps(s), the evaporator pump(s) and possible auxiliaries) to reach the rated refrigeration capacity, expressed in kW to two decimal places;

107) ‘rated energy efficiency ratio’ (EER_A) means the rated refrigeration capacity, expressed in kW divided by the rated power input, expressed in kW, expressed to two decimal places;

108) ‘seasonal energy performance ratio’ (SEPR) is the efficiency ratio of a high temperature process chiller, representative of the variations in load and ambient temperature throughout the year, and calculated as the ratio between the annual refrigeration demand and the annual electricity consumption;

109) ‘annual refrigeration demand’ means the sum of each bin-specific refrigeration load demand multiplied by the corresponding number of bin hours;

110) ‘refrigeration load’ means the rated refrigeration capacity multiplied by the part load ratio high temperature process chillers, expressed in kW to two decimal places;

111) ‘part load’ ($P_C(Tj)$) means the refrigeration load at a specific ambient temperature (Tj), calculated as the full load multiplied by the part load ratio high temperature process chillers corresponding to the same ambient temperature T_j and expressed in kW at two decimal places;

112) ‘part load ratio high temperature process chillers’ ($P_R(Tj)$) means :

a) for high temperature process chillers using air-cooled condensers, the ambient temperature Tj minus 5 ºC divided by the reference ambient temperature minus 5 ºC multiplied by 0.2 and added to 0.8. For ambient temperatures higher than the reference ambient temperature, the part load ratio high temperature process chillers shall be 1. For ambient temperatures lower than 5°C, the part load ratio high temperature process chillers shall be 0.8;

b) for high temperature process chillers using water-cooled condensing, the ambient temperature (water inlet to condenser) minus 9°C divided by the reference ambient temperature (water inlet to condenser) minus 9°C multiplied by 0.2 and added to 0.8. For ambient temperatures (water inlet to condenser) higher than the reference ambient temperature, the part load ratio high temperature process chillers shall be 1. For ambient temperatures lower than 9°C (water inlet to condenser), the part load ratio high temperature process chillers shall be 0.8;

c) which can be expressed to three decimal places or in percentage, after multiplying by 100, to one decimal place;

113) ‘annual electricity consumption’ is calculated as the sum of the ratios between each bin-specific cooling demand and the corresponding bin-specific energy efficiency ratio, multiplied by the corresponding number of bin hours;

114) ‘ambient temperature’ means:

a) for process chillers using air-cooled condensing, the air dry bulb temperature, expressed in degrees Celsius;

b) for process chillers using water-cooled condensing, the inlet temperature of water at the outdoor heat exchanger, expressed in degrees Celsisus;

115) 'reference ambient temperature' means the ambient temperature, expressed in degrees Celsius, at which the part load ratio high temperature process chillers is equal to 1. It shall be set at 35°C outdoor air temperature for air-cooled high temperature process chillers and 30°C water inlet temperature for water-cooled high temperature process chillers with 35°C outdoor air temperature to the condenser;

116) 'energy efficiency ratio at part load' ($EER_{PL}(Tj)$) means the energy efficiency ratio for every bin in the year, derived from the declared energy efficiency ratio for specified bins and calculated for other bins by linear interpolation;

117) 'declared refrigeration load' means the refrigeration load at specified bin conditions, and calculated as the rated refrigeration capacity multiplied by the corresponding part load ratio high temperature process chillers;

118) 'declared energy efficiency ratio' (EER_{DC}) means the energy efficiency ratio of the high temperature process chiller at a specific rating point, corrected where necessary by the degradation coefficient if the minimum declared refrigeration capacity exceeds the refrigeration load or interpolated if the nearest declared refrigeration capacities lie above and below the refrigeration load ;

119) 'declared power input' means the electrical power input needed by the high temperature process chiller to meet the declared cooling capacity at a specific rating point;

120) 'declared refrigeration capacity' means the refrigeration capacity delivered by the high temperature process chiller to meet the declared refrigeration demand at a specific rating point;

121) 'degradation coefficient chillers' (Cc) means the measure of efficiency loss due to cycling of comfort or high temperature process chillers at part load; if Cc is not determined by measurement, then the default degradation coefficient chillers is Cc = 0,9;

Annex II

Ecodesign requirements

1) Seasonal space heating energy efficiency of air heating products:

   a) From 1 January 2017 the seasonal space heating energy efficiency and useful efficiencies of air heating products shall not fall below the values in Table 1;

Table 1

First tier minimum seasonal space heating energy efficiency and useful efficiencies of air heating products, expressed in %

Warm air heater using fuels	72
Warm air heater using electricity	30
heat pump, driven by an electric motor, except rooftop heat pump and except sorption cycle heat pump	133
rooftop heat pump	115
heat pump, driven by an internal combustion engine	133

   b) From 1 January 2020 the seasonal space heating energy efficiency and useful efficiencies of heaters shall not fall below the values in Table 2;

Table 2

Second tier minimum seasonal space heating energy efficiency and useful efficiencies of air heating products, expressed in %

Warm air heater using fuels	78
Warm air heater using electricity	32
Air-to-air heat pump, driven by an electric motor, except rooftop heat pump and except sorption cycle heat pump	137
rooftop heat pump	125
Air-to-air heat pump, driven by an internal combustion engine	137

2) Seasonal space cooling energy efficiency of cooling products:

   a) From 1 January 2017 the seasonal space cooling energy efficiency and useful efficiencies of cooling products shall not fall below the values in Table 3;

Table 3

First tier minimum seasonal space cooling energy efficiency and useful efficiencies of cooling products, expressed in %

	GWP > 150	GWP ≤ 150
Air-to-water chiller with rated cooling capacity < 400 kW, when driven by an electric motor	157	41
Air-to-water chiller with rated cooling capacity ≥ 400 kW when driven by an electric motor	173	156
Water/brine to-water chiller with rated cooling capacity < 400 kW when driven by an electric motor	196	179
Water/brine to-water chiller with 400 kW < rated cooling capacity ≤ 1500 kW when driven by an electric motor	256	230
Water/brine to-water chiller with rated cooling capacity > 1500 kW when driven by an electric motor	256	230
Air-to-water chillers, when driven by an internal combustion engine	157	128

Air-to-air conditioner, driven by an electric motor, except rooftop air conditioner and except sorption cycle heat pump	181	163
rooftop air conditioner	117	105
Air-to-air air conditioner, driven by an internal combustion engine	157	141

b) From 1 January 2020 the seasonal space cooling energy efficiency and useful efficiencies of cooling products shall not fall below the values in Table 4;

Table 4

Second tier minimum seasonal space cooling energy efficiency and useful efficiencies of cooling products, expressed in %

	GWP > 150	GWP < 150
Air-to-water chiller with rated capacity < 400 kW, when driven by an electric motor	161	145
Air-to-water chiller with rated capacity ≥ 400 kW when driven by an electric motor	185	167
Water/brine to-water -cooled chiller with rated cooling capacity < 400 kW when driven by an electric motor	200	180
Water/brine to-water -cooled chiller with 400 kW ≤ rated cooling capacity < 1500 kW when driven by an electric motor	272	245
Water/brine to-water -cooled chiller with rated cooling capacity ≥ 1500 kW when driven by an electric motor	272	245
Air-to-water chiller with rated capacity < 400 kW, when driven by a internal combustion engine	167	132
Air-to-air conditioner, driven by an electric motor, except rooftop air conditioner and except sorption cycle heat pump	189	169
rooftop air conditioner	138	124
Air-to-air air conditioner, driven by an internal combustion engine	167	150

3) Seasonal energy performance ratio of high temperature process chillers:

a) From 1 January 2017 the seasonal energy performance ratio of high temperature process chillers shall not fall below the values in Table 5;

Table 5

First tier seasonal energy performance ratio of high temperature process chillers, expressed in %

Heat transfer medium at the condensing side	Rated refrigeration capacity	Minimum SEPR value
Air	P_A < 400 kW	4.5
	$P_A \geq$ 400 kW	5.0
Water	P_A < 400 kW	6.5
	400 kW ≤ P_A < 1500 kW	7.5
	$P_A \geq$ 1500 kW	8.0

b) From 1 January 2020 the seasonal energy performance ratio of high temperature process chillers shall not fall below the values in Table 6

Table 6

Second tier seasonal energy performance ratio of high temperature process chillers, expressed in %

Heat transfer medium at the condensing side	Rated refrigeration capacity	Minimum SEPR value
Air	P_A < 400 kW	5.0
	$P_A \geq$ 400 kW	5.5

Water	$P_A < 400$ kW	7.0
	400 kW $\leq P_A < 1500$ kW	8.0
	$P_A \geq 1500$ kW	8.5

5) Emissions of nitrogen oxides:

a) From 1 January 2017 the emissions of nitrogen oxides, expressed in nitrogen dioxide, of warm air heaters, heat pump, comfort chillers and high temperature chillers and air conditioners shall not exceed values in Table 7:

Table 7

First tier maximum nitrogen oxide emissions, expressed in mg/kWh fuel input in terms of GCV

Warm air heaters using gaseous fuels	200
Warm air heaters using liquid fuels	350
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with external combustion engines using gaseous fuels	70
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with external combustion engines using liquid fuels	120
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with internal combustion engines using gaseous fuels	500
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with internal combustion engines using liquid fuels	850

b) From 1 January 2020 the emissions of nitrogen oxides, expressed in nitrogen dioxide, of warm air heaters, heat pump, comfort chillers and high temperature chillers and air conditioners shall not exceed values in Table 8:

Table 8

Second tier maximum nitrogen oxide emissions, expressed in mg/kWh fuel input in terms of GCV

Warm air heaters using gaseous fuels	150
Warm air heaters using liquid fuels	240
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with internal combustion engines using gaseous fuels	350
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with internal combustion engines using liquid fuels	600

6) Product information:

a) From 1 January 2017 the instruction manuals for installers and end-users, and free access websites of manufacturers, their authorised representatives and importers shall provide the following product information:

i) For warm air heaters, the information set out in Table 9 of this Annex, measured and calculated in accordance with Annex III;

ii) For comfort chillers, the information set out in Table 10 of this Annex, measured and calculated in accordance with Annex III;

iii) For air-to-air conditioners, the information set out in Table 11 of this Annex, measured and calculated in accordance with Annex III;

iv) For water/brine-to-air air conditioners, the information set out in Table 12 of this Annex, measured and calculated in accordance with Annex III;

v) For fan coil units, the information set out in Table 13 of this Annex, measured and calculated in accordance with Annex III;

vi) For heat pumps, the information set out in Table 14 of this Annex, measured and calculated in accordance with Annex III;

vii) For high temperature process chillers, the information set out in Table 15 of this Annex, measured and calculated in accordance with Annex III

viii) Any specific precautions that must be taken when the product is assembled, installed or maintained;

ix) For heat generators or cold generators designed for air heating or cooling products, and air heating or cooling product housings to be equipped with such heat or cold generators, their characteristics, the requirements for assembly, to ensure compliance with the ecodesign requirements for air heating or cooling products and, where appropriate, the list of combinations recommended by the manufacturer;

x) Information relevant for disassembly, recycling and/or disposal at end-of-life;

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

i) the elements specified in point (a);

ii) where the information relating to a specific model has been obtained by calculation on the basis of design, and/or extrapolation from other combinations, the technical documentation shall include details of such calculations and/or extrapolations, and of tests undertaken to verify the accuracy of the calculations undertaken, including details of the mathematical model for calculating performance of such combinations, and of measurements taken to verify this model, and a list of any other products where the information included in the technical documentation was obtained on the same basis;

Table 9

Information requirements for warm air heaters

Information to identify the model(s) to which the information relates to:							
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Capacity				Useful efficiency			
Rated heating capacity	P_{nom}	x,x	kW	Useful efficiency at rated heating capacity*	η_{nom}	x,x	%
Minimal capacity	P_{min}	x,x	kW	Useful efficiency at minimal capacity*	η_{min}	x,x	%
Auxiliary electricity consumption*				Other items			
At rated heating capacity	el_{max}	x,x	kW	Envelope losses	P_{env}	x,x	kW
At minimal capacity	el_{min}	x,x	kW	Ignition burner power consumption *	P_{ign}	x,x	kW
In standby mode	el_{sb}	x,x	kW	Emissions of nitrogen oxides *	NO_x	x	mg/kWh input energy (GCV)
				Seasonal space heating energy efficiency	η_s	x,x	%
* not required if using gaseous or liquid fuels							
Contact details	Name and address of the manufacturer or of its authorised representative.						

Table 10

Information requirements for comfort chillers

Model(s): Information to identify the model(s) to which the information relates to:							
Outdoor heat exchanger of chiller: [select which: air or water/brine]							
Indoor heat exchanger chiller: [default: water]							
Parameters shall be declared for average cooling season							
Type: compressor driven vapour compression or sorption process							
if applicable: driver of compressor: [electric motor or fuel driven]							
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated cooling capacity	Prated,c	x,x	kW	Seasonal space cooling energy efficiency (SEER or SPERc)	ηs	x,x	%
Declared cooling capacity for part load at given outdoor temperatures Tj				Declared energy efficiency ratio or gas utilization efficiency / auxiliary energy factor for part load at given outdoor temperatures Tj			
Tj = +35 ºC	Pdc	x,x	kW	Tj = +35 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 30 ºC	Pdc	x,x	kW	Tj = + 30 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 25 ºC	Pdc	x,x	kW	Tj = + 25 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 20 ºC	Pdc	x,x	kW	Tj = + 20 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Degradation co-efficient chillers**	Cc	x,x	-				
Power consumption in modes other than 'active mode'							
Off mode	P_{OFF}	x,x	kW	Crankcase heater mode	P_{CK}	x,x	kW
Thermostat-off mode	P_{TO}	x,x	kW	Standby mode	P_{SB}	x,x	kW
Other items							
Capacity control	fixed/variable			For air-to-water comfort chillers: Nominal air flow rate, outdoor measured	-	x	m^3/h
Sound power level, outdoor	L_{WA}	x,x / x,x	dB	For water-/brine-to-water chillers: Rated brine or water flow rate, outdoor heat exchanger	-	x	m^3/h
Emissions of nitrogen oxides	NOx	x,x	mg/kWh input GCV				
Contact details	Name and address of the manufacturer or of its authorised representative.						
** If Cc is not determined by measurement then the default degradation coefficient chillers shall be Cc = 0,9.							

Table 11

Information requirements for air-to-air conditioners

Model(s): Information to identify the model(s) to which the information relates to:							
Outdoor heat exchanger of air conditioner: [default: air]							
Indoor heat exchanger of air conditioner: [default: air]							
Type: compressor driven vapour compression or sorption process							
if applicable: driver of compressor: [electric motor or internal combustion]							
Parameters shall be declared for average cooling season							
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated cooling capacity	Prated,c	x,x	kW	Seasonal space cooling energy efficiency (SEER or SPERc)	ηs	x,x	%
Declared cooling capacity for part load at given outdoor temperatures Tj and indoor 27º/19ºC (dry/wet bulb)				Declared energy efficiency ratio or gas utilization efficiency / auxiliary energy factor for part load at given outdoor temperatures Tj			
Tj = +35 ºC	Pdc	x,x	kW	Tj = +35 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 30 ºC	Pdc	x,x	kW	Tj = + 30 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 25 ºC	Pdc	x,x	kW	Tj = + 25 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 20 ºC	Pdc	x,x	kW	Tj = + 20 ºC	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Degradation co-efficient air conditioners**	Cdc	x,x	-				
Power consumption in modes other than 'active mode'							
Off mode	P_{OFF}	x,x	kW	Crankcase heater mode	P_{CK}	x,x	kW
Thermostat-off mode	P_{TO}	x,x	kW	Standby mode	P_{SB}	x,x	kW
Other items							
Capacity control	fixed/staged/variable			For air-to-water chillers: Nominal air flow rate, outdoor measured	-	x	m^3/h
Sound power level, outdoor	L_{WA}	x,x / x,x	dB				
if engine driven: Emissions of nitrogen oxides	NOx	x	mg/kWh fuel input GCV				
Contact details	Name and address of the manufacturer or of its authorised representative.						
** If Cdc is not determined by measurement then the default degradation coefficient air conditioners shall be Cd = 0.25.							

Table 12

Information requirements for water/brine-to-air air conditioners

Model(s): Information to identify the model(s) to which the information relates to:									
Outdoor heat exchanger of air conditioner: [default: water/brine]									
Indoor heat exchanger of air conditioner: [default: air]									
Type: compressor driven vapour compression or sorption process									
if applicable: driver of compressor: [electric motor or fuel driven]									
Parameters shall be declared for the average cooling season									
Item			Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated cooling capacity			Prated,c	x,x	kW	Seasonal space cooling energy efficiency (SEER or SPERc)	ηs	x,x	%
Declared cooling capacity for part load at given outdoor temperatures Tj and indoor 27°/19°C (dry/wet bulb)						Declared energy efficiency ratio or gas utilization efficiency / auxiliary energy factor for part load at given outdoor temperatures Tj			
Outdoor temperature Tj	cooling tower (inlet/outlet)	ground coupled							
Tj = +35 °C	30/35	10/15	Pdc	x,x	kW	Tj = +35 °C	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 30 °C	26/*	10/*	Pdc	x,x	kW	Tj = + 30 °C	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 25 °C	22/*	10/*	Pdc	x,x	kW	Tj = + 25 °C	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Tj = + 20 °C	18/*	10/*	Pdc	x,x	kW	Tj = + 20 °C	EERd or GUE_{cPL}/AEF_{con}	x,x	%
Degradation co-efficient air conditioners**			Cdc	x,x	-				
Power consumption in modes other than 'active mode'									
Off mode			P_{OFF}	x,x	kW	Crankcase heater mode	P_{CK}	x,x	kW
Thermostat-off mode			P_{TO}	x,x	kW	Standby mode	P_{SB}	x,x	kW
Other items									
Capacity control			fixed/variable			For water-/brine-to-water chillers: Rated brine or water flow rate, outdoor heat exchanger	-	x	m^3/h
Sound power level, outdoor			LWA	x,x / x,x	dB				
if engine driven Emissions of nitrogen oxides			NOx	x	mg/kWh				
Emissions of carbon monoxide			CO	x,x	mg/kWh input GCV				
Combination heater: yes/no									
Contact details	Name and address of the manufacturer or of its authorised representative.								
** If Cdc is not determined by measurement then the default degradation coefficient air conditioners shall be Cdc = 0.25.									

Table 13

Information requirements for fan coil units

Information to identify the model(s) to which the information relates to:							
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Cooling capacity (sensible)	Prated,c	x,x	W	Electricity consumption	Pon	x,x	W
Cooling capacity (latent)	Prated,c	x,x	W	Sound power level (per speed setting, if applicable)	L_{WA}	x / etc.	dB
Contact details	Name and address of the manufacturer or of its authorised representative.						

Table 14

Information requirements for heat pumps

Information to identify the model(s) to which the information relates to:								
Outdoor heat exchanger of air conditioner: [select which: air/water/brine]								
Indoor heat exchanger of air conditioner: [default: air]								
Indication if the heater is equipped with a supplementary heater: yes/no								
Indication if the heater is a heat pump combination heater: yes/no								
Parameters shall be declared for the average heating season								
Item	Symbol	Value	Unit	Item	Symbol		Value	Unit
Rated heating capacity	Prated,h	x,x	kW	Seasonal space heating energy efficiency	ηs		x,x	%
Declared heating capacity for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or gas utilization efficiency / auxiliary energy factor for part load at given outdoor temperatures Tj				
Tj = - 7 ºC	Pdh	x,x	kW	Tj = - 7 ºC	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
Tj = + 2 ºC	Pdh	x,x	kW	Tj = + 2 ºC	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
Tj = + 7 ºC	Pdh	x,x	kW	Tj = + 7 ºC	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
Tj = + 12 ºC	Pdh	x,x	kW	Tj = + 12 ºC	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
Tj = bivalent temperature	Pdh	x,x	kW	Tj = bivalent temperature	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
Tj = operation limit	Pdh	x,x	kW	Tj = operation limit	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
For air-to-water heat pumps: Tj = - 15 ºC (if T_{OL} < - 20 ºC)	Pdh	x,x	kW	For air-to-water heat pumps: Tj = - 15 ºC (if TOL < -20 ºC)	COPd GUE_{hPL}/AEF_{hon}	or	x,x	%
Bivalent temperature	Tbiv	x	ºC	For air-to-water heat pumps: Operation limit temperature	TOL		x	ºC
Degradation co-efficient heat pumps**	Cdh	x,x	-	For water/brine-to-water heat pumps: Heating water operating limit temperature	WTOL		x	°C
Power consumption in modes other than 'active mode'				Supplementary heater				
Off mode	P_{OFF}	x,x	kW	Electric back-up heating capacity *	elbu		x,x	kW
Thermostat-off mode	P_{TO}	x,x	kW	Type of energy input				
Crankcase heater mode	P_{CK}	x,x	kW	Standby mode	P_{SB}		x,x	kW
Other items								
Capacity control	fixed/variable			For air-to-water heat pumps: Nominal air flow rate, outdoor measured	-		x	m³/h
Sound power level, indoor / outdoor measured	L_{WA}	x,x / x,x	dB	For water-/brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	-		x	m³/h
Emissions of nitrogen oxides	NOx	x	mg/kWh					
Contact details	Name and address of the manufacturer or of its authorised representative.							
** If Cdh is not determined by measurement then the default degradation coefficient heat pumps shall be Cdh = 0,25.								

Table 15

Information requirements for high temperature process chillers

Information to identify the model(s) to which the information relates to:			
Type of condensing: [air cooled /water cooled]			
Refrigerant fluid(s): [information identifying the refrigerant fluid(s) intended to be used with the process chiller]			
Item	Symbol	Value	Unit
Operating temperature	t	7	ºC
Seasonal energy performance ratio	SEPR	x,xx	[-]
Annual electricity consumption	Q	x	kWh/a
Parameters at full load and reference ambient temperature Point A **			
Rated refrigeration capacity	P_A	x,xx	kW
Rated power input	D_A	x,xx	kW
Rated energy efficiency ratio	EER_A	x,xx	[-]
Parameters at rating point B			
Declared refrigeration capacity	P_B	x,xx	kW
Declared power input	D_B	x,xx	kW
Declared energy efficiency ratio	EER_B	x,xx	[-]
Parameters at rating point C			
Declared refrigeration capacity	P_C	x,xx	kW
Declared power input	D_C	x,xx	kW
Declared energy efficiency ratio	EER_C	x,xx	[-]
Parameters at rating point D			
Declared refrigeration capacity	P_D	x,xx	kW
Declared power input	D_D	x,xx	kW
Declared energy efficiency ratio	EER_D	x,xx	[-]
Other items			
Capacity control	fixed/staged**/variable		
Degradation co-efficient chillers*	Cc	x,xx	[-]
Contact details	Name and address of the manufacturer or of its authorised representative.		
* If Cc is not determined by measurement then the default degradation coefficient chillers shall be Cc = 0,9. If the default Cc value is chosen, then results from cycling tests are not required. Otherwise, the cooling cycling test value is required.			
** For staged capacity units, two values divided by a slash ('/') will be declared in each box in the section referring to 'cooling capacity' and 'EER'			

Annex III

Measurement and Calculation

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 other reliable, accurate and reproducible method, which takes into account the generally recognised state-of-the-art methods. They shall fulfil the conditions and technical parameters set out in points 2 to 6.

2) General conditions for measurements and calculations:

   a) For the purposes of the calculations set out in points 3 to 5, consumption of electricity shall be multiplied by the conversion coefficient CC of 2,5;

   b) Emissions of nitrogen oxides shall be measured as sum of nitrogen monoxide and nitrogen dioxide, and expressed in nitrogen dioxide;

   c) For heat pumps equipped with supplementary heaters, the measurement and calculation of rated heating capacity, seasonal space heating energy efficiency, sound power level and emissions of nitrogen oxides shall take account of the supplementary heater;

   d) A heat generator designed for an air heating product, or a housing to be equipped with such a generator shall be tested with an appropriate housing and generator, respectively;

   e) A cold generator designed for a cooling product, or a housing to be equipped with such a generator shall be tested with an appropriate housing and generator, respectively.

3) Seasonal space heating energy efficiency of warm air heaters

   a) The seasonal space heating energy efficiency ηs shall be calculated as the seasonal space heating energy efficiency in active mode $\eta_{s,on}$ which includes consideration of the envelope losses and the emission efficiency, corrected by contributions accounting for heat output control, auxiliary electricity consumption, vented flue losses and ignition burner power consumption (if applicable).

4) Seasonal space cooling energy efficiency of comfort chillers and electric air conditioners:

   a) For the purposes of the measurements of chillers and air conditioners set out in point 5 the indoor ambient temperature shall be set at 27 °C;

   b) While establishing the sound power level, the operating conditions shall be the standard rating conditions set out in Table 16 (air-to-air air conditioners), Table 17 (water-cooled comfort chillers), Table 18 (air-cooled comfort chillers), Table 19 (water/brine-to-air air conditioners);

   c) The active mode seasonal energy efficiency ratio $SEER_{on}$ shall be calculated on the basis of the part load for cooling load $Ph(T_j)$ and the bin-specific energy efficiency ratio $EER_{bin}(T_j)$, and weighted by the bin-hours the bin conditions occurs, using the following conditions:

      i) the reference design conditions set out in Table 24;

      ii) the European average cooling season set out in Table 26;

iii) if applicable, the effects of the degradation of the energy efficiency caused by cycling depending on the type of control of the cooling output;

iv) The reference annual cooling demand Q_C, shall be the design load for cooling $P_{designc}$ multiplied by the annual equivalent active mode hours H_{HE} is set out in Table 28;

v) The annual energy consumption for cooling Q_{CE} shall be calculated as the sum of:

(1) the ratio of the reference annual cooling demand Q_C and the active mode energy efficiency ratio $SEER_{on}$ and

(2) the energy consumption during thermostat-off, off and crankcase heater mode during the season;

vi) The seasonal energy efficiency ratio SEER shall be calculated as the ratio of the reference annual cooling demand Q_C and the reference annual energy consumption for cooling Q_{CE};

vii) The seasonal space cooling energy efficiency ηsc shall be calculated as the seasonal energy efficiency ratio SEER divided by the conversion coefficient CC, corrected by contributions accounting for temperature control and, for water-cooled chillers only, the electricity consumption of ground water pump(s).

5) Seasonal space cooling energy efficiency of internal combustion comfort chillers and air conditioners

a) The seasonal space cooling energy efficiency η_{sC} shall be calculated on the basis of the seasonal primary energy ratio in cooling mode $SPER_C$, corrected by contributions accounting for temperature control and, for water-cooled comfort chillers only, the electricity consumption of ground water pump(s).

b) The seasonal primary energy efficiency ratio in cooling mode $SPER_C$ shall be calculated on the basis of seasonal gas utilization efficiency ratio in cooling mode $SGUE_C$, the seasonal auxiliary energy factor in cooling mode $SAEF_C$ taking into account the primary energy factor for electricity CC.

c) The seasonal gas utilization efficiency ratio in cooling mode SGUEC shall be based on the part load for cooling PC(Tj) divided by the bin-specific gas utilization efficiency ratiofor cooling in part load GUECPL, weighted by the bin-hours the bin conditions occurs, using the conditions set out below;

d) The SAEFC shall be based on the reference cooling demand QrefC and the reference annual energy consumption for cooling Q_{CE};

e) The reference annual cooling demand Qref,C shall be based on the reference cooling capacity Pdesign,c multiplied by the annual equivalent active mode hours HCE as set out in Table 28;

f) The annual energy consumption for cooling Q_{CE} shall be calculated as the sum of:

i) the ratio of the reference annual cooling demand Q_C and the seasonal auxiliary energy factor for cooling in active mode SAEFCon and

ii) the energy consumption during thermostat-off, off and crankcase heater mode during the designated season;

g) The SAEFCon shall be based(insofar relevant) on the part load for cooling PC(Tj) and the auxiliary energy factor for cooling in part load AEFCPL, weighted by the bin-hours the bin conditions occurs using the conditions set out below;

h) The conditions to calculate the SGUEC and the SAEFCon shall take into account:

i) the reference design conditions set out in Table 24;

ii) the European average cooling season set out in Table 26;

iii) if applicable, the effects of the degradation of the energy efficiency caused by cycling depending on the type of control of the cooling output;

6) Seasonal space heating energy efficiency of electric heat pumps:

a) For the purposes of the measurements heat pumps set out in point 4 the indoor ambient temperature shall be set at 20 °C;

b) While establishing the sound power level, the operating conditions shall be the standard rating conditions set out in Table 16 (air-to-air heat pumps), Table 19 (water/brine-to-air heat pumps);

c) The active mode coefficient of performance $SCOP_{on}$ shall be calculated on the basis of the part load for heating $Ph(T_j)$, the electric back-up heating capacity $elbu(T_j)$ (if applicable) and the bin-specific coefficient of performance $COPbin(T_j)$ and weighted by the bin-hours the bin conditions occurs, using the following conditions:

i) the reference design conditions set out in Table 24;

ii) the European 'average' heating season set out in Table 25;

iii) if applicable, the effects of the degradation of the energy efficiency caused by cycling depending on the type of control of the heating output;

d) The reference annual heat demand Q_H, shall be the design load for heating $P_{designh}$ multiplied by the annual equivalent active mode hours H_{HE} is set out in Table 28;

e) The annual energy consumption for heating Q_{HE} shall be calculated as the sum of:

i) the ratio of the reference annual heating demand Q_H and the active mode coefficient of performance $SCOP_{on}$ and;

ii) the energy consumption for thermostat-off, off and crankcase heater mode during the season;

f) The seasonal coefficient of performance SCOP shall be calculated as the ratio of the reference annual heat demand Q_H and the annual energy consumption for heating Q_{HE};

g) The seasonal space heating energy efficiency ηs shall be calculated as the seasonal coefficient of performance SCOP divided by the conversion coefficient CC, corrected by contributions accounting for temperature control

7) Seasonal space heating energy efficiency of internal combustion comfort chillers and air conditioners

i) The seasonal space heating energy efficiency η_{sH} shall be calculated on the basis of the seasonal primary energy ratio in heating mode $SPER_H$, corrected by contributions accounting for temperature control and, for water-cooled comfort chillers only, the electricity consumption of ground water pump(s).

j) The seasonal primary energy efficiency ratio in heating mode $SPER_H$ shall be calculated on the basis of seasonal gas utilization efficiency ratio in heating mode $SGUE_H$, the seasonal auxiliary energy factor in heating mode $SAEF_H$ taking into account the primary energy factor for electricity CC.

k) The seasonal gas utilization efficiency ratio in heating mode SGUEH shall be based on the part load for heating oling PH(Tj) divided by the bin-specific gas utilization efficiency ratio for heating in part load GUEHPL, weighted by the bin-hours the bin conditions occurs, using the conditions set out below;

l) The SAEFH shall be based on the reference heating demand QrefH and the reference annual energy consumption for heating Q_{HE};

m) The reference annual cooling demand Qref,H shall be based on the reference heating capacity $P_{design,H}$ multiplied by the annual equivalent active mode hours H_{HE} as set out in Table 28;

n) The annual energy consumption for heating Q_{HE} shall be calculated as the sum of:

   i) the ratio of the reference annual heating demand Q_H and the seasonal auxiliary energy factor for heating in active mode SAEFHon and

   ii) the energy consumption during thermostat-off, off and crankcase heater mode during the designated season;

o) The SAEFHon shall be based(insofar relevant) on the part load for heating PH(Tj) and the auxiliary energy factor for heating in part load AEFHPL, weighted by the bin-hours the bin conditions occurs using the conditions set out below;

p) The conditions to calculate the SGUEH and the SAEFHon shall take into account:

   i) the reference design conditions set out in Table 24;

   ii) the European average heating season set out in Table 26;

   iii) if applicable, the effects of the degradation of the energy efficiency caused by cycling depending on the type of control of the cooling output;

8) General conditions for measurements and calculations of high temperature process chillers

For establishing the values of rated and declared cooling capacity, power input, energy efficiency ratio and the seasonal energy performance ratio, measurements shall be done using the following conditions:

a) the reference ambient temperature at the outdoor heat exchanger shall be 35°C for air-cooled high temperature chillers and 30°C water inlet temperature to the condenser (rating point with 35°C outdoor air temperature) for water-cooled high temperature chillers

b) the outlet temperature of the liquid at the indoor heat exchanger shall be 7°C dry bulb temperature;

c) the variations of the ambient temperature throughout the year, representative of average climate conditions in the European Union, and the corresponding number of hours when these temperatures occur, shall be as set out in Table 27;

d) the effect of the degradation of energy efficiency caused by cycling depending on the type of capacity control of the process chiller shall be measured or a default value shall be used;

Table 16

Standard rating conditions for air-to-air heat pumps and air conditioners

		Outdoor heat exchanger		Indoor heat exchanger	
		inlet dry bulb temperature ºC	inlet wet bulb temperature ºC	inlet dry bulb temperature ºC	inlet wet bulb temperature ºC
Heating mode (for heat pumps)	Outside air / recycled air	7	6	20	15 max
	Exhaust air / outdoor air	20	12	7	6
Cooling mode (for air conditioners)	Outside air / recycled air	35	24*	27	19
	Exhaust air / recycled air	27	19	27	19
	Exhaust air / outdoor air	27	19	35	24

* the wet bulb temperature condition is not required when testing units which do not evaporate condensate

Table 17

Standard rating conditions for water-cooled comfort chillers (water/brine to water)

		Outdoor heat exchanger		Indoor heat exchanger	
		inlet temperature ºC	outlet temperature ºC	inlet temperature ºC	outlet temperature ºC
Cooling mode	water-to-water (for medium temperature heating applications) from cooling tower	30	35	12	7
	water-to-water (for low temperature heating applications) from cooling tower	30	35	23	18
	water-to-brine from cooling tower	30	35	0	-5
	water/brine-to-water (for medium temperature heating applications)	10	15*	12	7
	water/brine-to-water (for low temperature heating applications)	10	15	23	18
	water/brine-to-brine	10	15	0	-5

* for units designed for heating and cooling mode, the flow rate obtained during the test at standard rating conditions in heating modes is used

Table 18

Standard rating conditions air-cooled comfort chillers (air-to-water/brine)

		Outdoor heat exchanger		Indoor heat exchanger	
		inlet temperature ºC	outlet temperature ºC	inlet temperature ºC	outlet temperature ºC
Cooling mode	air-to-water (for medium temperature applications)	35	-	12	7
	air-to-water (for low temperature applications)	35	-	23	18

	air-to-brine	35	-	0	-5

* For units designed for heating and cooling mode, the flow rate obtained during the test at standard rating conditions in heating modes is used

Table 19

Standard rating conditions for water/brine-to-air heat pumps and air conditioners

		Outdoor heat exchanger		Indoor heat exchanger	
		inlet temperature ºC	outlet temperature ºC	inlet dry bulb temperature ºC	inlet wet bulb temperature ºC
Heating mode (for heat pumps)	water	10	7	20	15 max
	brine	0	-3 *	20	15 max
	water loop	20	17*	20	15 max
Cooling mode (for air conditioners)	cooling tower	30	35	27	19
	ground coupled (water or brine)	10	15	27	19

* For units designed for heating and cooling mode, the flow rate obtained during the test at standard rating conditions in cooling mode is used.

Table 20

Reference ambient temperatures for high temperature process chillers

Test point	**Part load ratio high temperature process chillers**	**Part load ratio (%)**	**Outdoor heat exchanger**	**Indoor heat exchanger**
				Evaporator inlet/outlet water temperatures (°C)
				Fixed outlet
A	80% + 20%*(T_A-T_D)/(T_A-T_D)	100%	**inlet air temperature** 35 **(°C)**	12/ 7
			Inlet/ outlet water temperatures 30 / 35 **(°C)**	

Table 21

Part load conditions for air conditioners, comfort chillers and heat pumps

	part load ratio	outdoor heat exchanger		indoor heat exchanger		
Air-to-air air conditioners						
Tj (ºC)		outdoor air dry bulb temperatures (ºC)		indoor air dry bulb (wet bulb) temperatures (ºC)		
35	100%	35		27 (19)		
30	74%	30		27 (19)		
25	47%	25		27 (19)		
20	21%	20		27 (19)		
Water-to-air air conditioners						
Tj (ºC)		cooling tower or water loop application inlet/outlet temperatures (ºC)	ground coupled application (water or brine) inlet/outlet temperatures (ºC)	indoor air dry bulb (wet bulb) temperatures (ºC)		
35	100%	30/35	10/15	27 (19)		
30	74%	26/*	10/*	27 (19)		
25	47%	22/*	10/*	27 (19)		
20	21%	18/*	10/*	27 (19)		
Air-to-water comfort chillers						
Tj (ºC)		outdoor air dry bulb temperatures (ºC)		fan coil application inlet/outlet water temperatures (ºC)		cooling floor application inlet/outlet water temperatures (ºC)
				fixed outlet	variable outlet**	
35	100%	35		12/7	12/7	23/18
30	74%	30		*/7	*/8.5	*/18
25	47%	25		*/7	*/10	*/18
20	21%	20		*/7	*/11.5	*/18
Water-to-water comfort chillers						
Tj (ºC)		cooling tower or water loop application inlet/outlet temperatures (ºC)	ground coupled application (water or brine) inlet/outlet temperatures (ºC)	fan coil application inlet/outlet water temperatures (ºC)		cooling floor application inlet/outlet water temperatures (ºC)
				fixed outlet	variable outlet**	
35	100%	30/35	10/15	12/7	12/7	23/18
30	74%	26/*	10/*	*/7	*/8.5	*/18
25	47%	22/*	10/*	*/7	*/10	*/18
20	21%	18/*	10/*	*/7	*/11.5	*/18
Air-to-air heat pumps						
Tj (ºC)		Outdoor air dry bulb (wet bulb) temperatures (ºC)		Indoor air dry bulb temperature (ºC)		
-7	88%	-7(-8)		20		
+2	54%	+2(+1)		20		
+7	35%	+7(+6)		20		
+12	15%	+12(+11)		20		
TOL	depends on TOL	Tj = TOL		20		
Tbiv	depends on Tbiv	Tj = Tbiv		20		
Water/brine-to-air heat pumps						
Tj (ºC)		Ground Water	Brine	Indoor air dry bulb temperature (ºC)		
		Inlet/outlet temperatures (ºC)	Inlet/outlet temperatures (ºC)			
-7	88%	10/*	0/*	20		

+2	54%	10/*	0/*	20
+7	35%	10/*	0/*	20
+12	15%	10/*	0/*	20
TOL	depends on TOL	10/*	0/*	20
Tbiv	depends on Tbiv	10/*	0/*	20

* outlet temperatures dependent on water flow rate as determined at standard rating conditions (100% part load ratio when cooling, 88% when heating)

** for tables indicating 'variable outlet' the table indicates the values to be used if the unit uses fixed flow. For units with variable outlet and variable flow, the mean temperature (T_{inlet}+T_{outlet}/0.5) during testing shall be the specified outlet temperatures corrected with a value of +2.5 (e.g use t_{mean} 11 instead of 8.5)

Table 22

Part load conditions for SEPR calculation for air cooled high temperature process chillers

Rating point	**Part load ratio high temperature process chillers**	**Part load ratio (%)**	**Outdoor heat exchanger**	**Indoor heat exchanger**
			inlet air temperature (°C)	**Evaporator inlet/outlet water temperatures (°C)**
				Fixed outlet
A	80% + 20%·(T_A-T_D)/(T_A-T_D)	100%	35	12/ 7
B	80% + 20%·(T_B-T_D)/(T_A-T_D)	93%	25	* / 7
C	80% + 20%·(T_C-T_D)/(T_A-T_D)	87%	15	* / 7
D	80% + 20%·(T_D-T_D)/(T_A-T_D)	80%	5	* / 7

* with the water flow rate as determined during "A" test for units with a fixed water flow rate or with a fixed ΔT of 5K for units with a variable water flow rate.

Table 23

Part load conditions for SEPR calculation for water cooled high temperature process chillers

Rating point	**Part load ratio high temperature process chillers**	**Part load ratio (%)**	**water-cooled condensor**		**Indoor heat exchanger**
			Inlet/ outlet water temperatures (°C)	**Outdoor air temperature (ºC)**	**Evaporator Inlet / outlet water temperatures (°C)**
					Fixed outlet
A	80% + 20%*(T_A-T_D)/(T_A-T_D)	100%	30 / 35	35	12/ 7
B	80% + 20%*(T_B-T_D)/(T_A-T_D)	93%	23 / [a]	25	* / 7
C	80% + 20%*(T_C-T_D)/(T_A-T_D)	87%	16 / [a]	15	* / 7
D	80% + 20%*(T_D-T_D)/(T_A-T_D)	80%	9 / [a]	5	* / 7

* with the water flow rate as determined during "A" test for units with a fixed water flow rate or with a fixed ΔT of 5K for units with a variable water flow rate.

Table 24

Reference design conditions for comfort chillers, air conditioners and heat pumps

Function	Season	Reference design temperature dry bulb (wet bulb)		
		Tdesignc		
Cooling	Average	35 (24) °C		
		Reference design temperature	Bivalent temperature maximum	Operation limit temperature maximum
		Tdesignh	Tbiv	TOL
Heating)	Average	- 10 (- 11) °C	+ 2 °C	- 7 °C
	Warmer	2 (-11) ºC	7 ºC	2 ºC
	Colder	-22 (-23) ºC	-7 ºC	-15 ºC

Table 25

European 'average' heating season for heat pumps

bin_i	T_i [°C]	H_i [h/annum]
1 to 20	-30 to -11	0
21	-10	1
22	-9	25
23	-8	23
24	-7	24
25	-6	27
26	-5	68
27	-4	91
28	-3	89
29	-2	165
30	-1	173
31	0	240
32	1	280
33	2	320
34	3	357
35	4	356
36	5	303
37	6	330
38	7	326
39	8	348
40	9	335
41	10	315
42	11	215
43	12	169
44	13	151
45	14	105
46	15	74
Total hours:		4 910

Table 26

European average, colder and warmer cooling season for comfort chillers and air conditioners

				OPTIONAL			
Bins	Outdoor temperature (dry bulb)	"Average cooling season" bin hours	EER calculation	"Colder cooling season" bin hours	EER calculation	"Warmer cooling season" bin hours	EER calculation
j	Tj	hj		hj		hj	
#	°C	h/annum		h/annum		h/annum	
1	17	205	EER(D)	182	EER(D)	130	EER(D)
2	18	227	EER(D)	148	EER(D)	170	EER(D)
3	19	225	EER(D)	121	D - Measured value	214	EER(D)
4	20	225	D - Measured value	91	Linear interpolation	258	D - Measured value
5	21	216	Linear interpolation	65	Linear interpolation	298	Linear interpolation
6	22	215	Linear interpolation	60	C - Measured value	331	Linear interpolation
7	23	218	Linear interpolation	44	Linear interpolation	352	Linear interpolation
8	24	197	Linear interpolation	30	Linear interpolation	359	Linear interpolation
9	25	178	C - Measured value	27	B - Measured value	352	C - Measured value
10	26	158	Linear interpolation	18	Linear interpolation	331	Linear interpolation
11	27	137	Linear interpolation	8	Linear interpolation	298	Linear interpolation
12	28	109	Linear interpolation	8	A - Measured value	258	Linear interpolation
13	29	88	Linear interpolation	1	EER(A)	214	Linear interpolation
14	30	63	B - Measured value			170	B - Measured value
15	31	39	Linear interpolation			130	Linear interpolation
16	32	31	Linear interpolation			95	Linear interpolation
17	33	24	Linear interpolation			67	Linear interpolation
18	34	17	Linear interpolation			45	Linear interpolation
19	35	13	A - Measured value			29	A - Measured value
20	36	9	EER(A)			18	EER(A)
21	37	4	EER(A)			11	EER(A)
22	38	3	EER(A)			6	EER(A)
23	39	1	EER(A)			3	EER(A)
24	40	0	EER(A)			2	EER(A)

Table 27

European reference refrigeration season for high temperature process chillers

binj	Tj [°C]	Hj [h/annum]
1	-19	0,08
2	-18	0,41
3	-17	0,65
4	-16	1,05
5	-15	1,74
6	-14	2,98
7	-13	3,79
8	-12	5,69
9	-11	8,94
10	-10	11,81
11	-9	17,29
12	-8	20,02
13	-7	28,73
14	-6	39,71
15	-5	56,61
16	-4	76,36
17	-3	106,07
18	-2	153,22
19	-1	203,41
20	0	247,98
21	1	282,01
22	2	275,91
23	3	300,61
24	4	310,77
25	5	336,48
26	6	350,48
27	7	363,49
28	8	368,91
29	9	371,63
30	10	377,32
31	11	376,53
32	12	386,42
33	13	389,84
34	14	384,45
35	15	370,45
36	16	344,96
37	17	328,02
38	18	305,36
39	19	261,87
40	20	223,90
41	21	196,31
42	22	163,04
43	23	141,78
44	24	121,93
45	25	104,46
46	26	85,77
47	27	71,54
48	28	56,57
49	29	43,35
50	30	31,02
51	31	20,21
52	32	11,85
53	33	8,17
54	34	3,83
55	35	2,09
56	36	1,21
57	37	0,52
58	38	0,40

Table 28

Operational hours per functional mode for comfort chillers, air conditioners and heat pumps

Season		Operational hours				
		On-mode	Thermostat Off	Standby	Off	Crankcase heater mode
		H_{CE} (cool); H_{HE} (warm)	H_{TO}	H_{SB}	H_{OFF}	H_{CK}
Cooling (to calculate SEER)	Average	600	659	1377	0	2036
	Colder	300	436	828	0	1264
	Warmer	900	767	1647	0	2414
Heating only (to calculate SCOP)	Average	1 400	179	0	3 672	3 851
	Colder	2 100	131	0	2 189	2 944
	Warmer	1 400	755	0	4 345	4 476
Heating, if reversible (to calculate SCOP)	Average	1400	179	0	0	179
	Colder	2100	131	0	0	131
	Warmer	1400	755	0	0	755

Annex IV

Verification procedures

When performing the market surveillance checks referred to in Article 3 (2) of Directive 2009/125/EC, the authorities of the Member States shall apply the following verification procedure for the requirements set out in Annex II:

1) The Member State authorities shall test one single unit per model.

   The air heating product, cooling product or high temperature process chiller product shall be considered to comply with the applicable requirements set out in Annex II to this Regulation;

   a) if the declared values comply with the requirements set out in Annex II;

   b) if for air heating products the seasonal space heating energy efficiency η_s is not less than the declared value minus 8 % at the rated heating capacity of the unit;

   c) if for cooling products the seasonal space cooling energy efficiency $\eta_{s\_cooling}$ is not less than the declared value minus 8 % at the rated cooling capacity of the unit;

   d) if for air heating product and/or cooling products the sound power level LWA is not more than the declared value plus 1,5 dB;

   e) if for fuel fired air heating or cooling products equipped the emissions of nitrogen oxides, expressed in nitrogen dioxide, are not more than the declared value plus 20 %;

   f) if for high temperature process chiller products:

      i) the SEPR value is not less than the declared value minus 10 % at the rated refrigeration capacity of the unit;

      ii) the rated energy efficiency ratio (EER_A) is not more than 5 % lower than the declared value, measured at the rated refrigeration capacity.

2) If the result referred to in point 2 is not achieved, the Member State authorities shall randomly select three additional units of the same model for testing.

   The air heating product, cooling product or high temperature process chiller product shall be considered to comply with the applicable requirements set out in Annex II to this Regulation;

   a) if the declared values comply with the requirements set out in Annex II;

   b) if for air heating products the average of the three units for seasonal space heating energy efficiency ηs is not less than the declared value minus 8 % at the rated heating capacity of the unit;

   c) if for cooling products the average of the three units for seasonal space cooling energy efficiency ηs_cooling is not less than the declared value minus 8 % at the rated cooling capacity of the unit;

   d) if for air heating product and/or cooling products the average of the three units for the sound power level LWA is not more than the declared value plus 1,5 dB;

   e) if for fuel fired air heating or cooling products equipped the average of the three units for the emissions of nitrogen oxides, expressed in nitrogen dioxide, are not more than the declared value plus 20 %;

   f) if for high temperature process chiller products:

i) the average of the three units for the SEPR value is not less than the declared value minus 6 % at the rated heating capacity of the unit, with point A measured at the rated refrigeration capacity;

ii) the average of the three units for the rated energy efficiency ratio (EER_A) is not more than 5 % lower than the declared value, measured at the rating cooling capacity;

g) If the results referred to in point 4 are not achieved, the model shall be considered not to comply with this Regulation.

3) Member State authorities shall use the measurement and calculation methods set out in Annex III;

4) Given the weight and size limitations in the transportation of air heating products, cooling products and high temperature process chillers, Member State authorities may decide to undertake the verification procedure at the premises of manufacturers, before they are put into service in their final destination.

5) The Member State authorities shall provide the test results and other relevant information to the authorities of the other Member States and to the Commission within one month of the decision being taken on the non-compliance of the model;

6) The verification tolerances defined in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the supplier as an allowed tolerance to establish the values in the technical documentation.

Annex V

Benchmarks

At the time of entry into force of this Regulation, the best available technology on the market for air heating products and cooling products in terms of seasonal space heating energy efficiency, seasonal space cooling energy efficiency or seasonal energy performance ratio, and emissions of nitrogen oxides was identified as follows:

1) Benchmarks for seasonal space heating or cooling energy efficiency or air heating products and cooling products and seasonal energy performance ratio of high temperature process chillers are described in Table 29;

Table 29

Benchmark for seasonal space heating or cooling energy efficiency of air heating products and cooling products and seasonal energy performance ratio for high temperature process chillers

Warm air heaters	using gaseous or liquid fuels	84%
	using electricity	33%
Comfort chillers	Air-cooled, $P_{ratedc} < 200$ kW	209%
	Air-cooled , $P_{ratedc} \geq 200$ kW	225%
	Water cooled , $P_{ratedc} < 200$ kW	272%
	Water cooled , $P_{ratedc} \geq 200$ kW	352%
Air conditioners	electric, air-to-air air conditioner	257%
Heat pumps	electric, air-to-air heat pump	177%
High temperature process chillers	air cooled, $P_A < 200$ kW	6.5 SEPR
	air cooled, 200 kW $\leq P_A < 400$ kW	8.0 SEPR
	air cooled, $P_A \geq 400$ kW	8.0 SEPR
	water cooled, $P_A < 200$ kW	8.5 SEPR
	water cooled, 200 kW $\leq P_A < 400$ kW	12.0 SEPR
	water cooled, 400 kW $\leq P_A < 1000$ kW	12.5 SEPR
	water cooled, $P_A \geq 1000$ kW	13.0 SEPR

2) Benchmarks for emissions of nitrogen oxides, expressed in nitrogen dioxide:

   a) For external combustion warm air heaters, heat pump heaters, chillers and air conditioners using gaseous fuel, the best available products in the market have emissions below 60 mg/kWh NO_x when measured at 0% O_2.

   b) For internal combustion warm air heaters, heat pump heaters, chillers and air conditioners using gaseous fuel, the best available products in the market have emissions of 350 mg/kWh NO_x when measured at 5% O_2.

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