WORKING DOCUMENT ON

Possible requirements for air heating products, cooling products and high temperature process chillers

DRAFT ECODESIGN REGULATION

COMMISSION WORKING DOCUMENT

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.

(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

[1] OJ L 285, 31.10.2009, p. 10.
[2] OJ L 161, 14.6.2006, p. 1.

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 heat pumps no bonus is considered for products using refrigerants with a GWP below 675, due to longer operating hours for heating products than for comfort 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 2 385 PJ (57 Mtoe) in the European Union in 2005 corresponding to 107 Mt CO_2 emissions. Unless specific measures are taken, annual energy consumption related to local space heaters is expected to be 2 687 PJ (64 Mtoe) in 2020 and 2 861 PJ (69 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 14 Mt SO_x equivalent/year in the European Union in 2005. These emissions are expected to be reduced to 8 Mt SO_x equivalent/year in 2020 and 4 Mt of SO_x equivalent 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 80 PJ (1.9 Mtoe), with related emission reduction of CO_2 of 3.7 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 225 PJ (5.4 Mtoe) corresponding to 9.9 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 0.4 Mt SO_x equivalent/year by 2020 and 0.6 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.

(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:

Chapter 1

Subject matter and scope

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

   a) air heating products, with a nominal load or rated heat output not exceeding 1 MW,

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

   c) fan coil units;

   d) high temperature process chillers.

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;

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

[4] *[To be inserted after publication]*

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

c) 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].

Chapter 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 a heat generator;

   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;

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 fossil fuels and/or biomass fuels;

   b) the Joule effect in electric resistance heating elements;

   c) by extracting heat from ambient air, water or ground heat source(s) and transferring this heat to the indoor spaces to be heated 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;

   b) is equipped with a cooling generator(s);

   A cooling generator designed for a cooling product and an cooling product housing to be equipped with such cooling 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

[5] OJ L 72, 10.3.2012, p. 7.
[6] OJ L 334, 17.12.2010, p. 17.

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) 'process cooling system' means the components of equipment necessary for the distribution of chilled water and heat transfer to heat from process cooling applications to chilled water, in order to attain and maintain the desired process temperature, the purpose of which is not to provide thermal comfort of human beings;

8) 'cooling generator' means the part of a cooling product that generates a certain temperature difference in components that allows heat to be transferred from the heat source, being the indoor space to be cooled, to a heat sink, not being the indoor space by extracting heat from indoor spaces and transferring this heat to ambient air, water or ground using a vapour compression cycle or a sorption cycle;

9) '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 cooling 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);

   d) may or may not operate in reverse.

10) '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 cooling 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;

11) 'high temperature process chiller' means a product which:

   a) is integrating at least one compressor, driven or intended to be driven by an electric motor, and one evaporator which are part of a vapour compression cycle;

   b) is capable of cooling down and continuously maintaining the temperature of a liquid in order to provide cooling to a process cooling system;

   c) is capable of delivering its rated cooling capacity at an indoor heat exchanger outlet temperature of 6°C, at standard rating conditions;

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

12) 'rated cooling capacity' means the cooling capacity which the process chiller is capable to reach, when operating at full load, and measured at standard rating conditions, expressed in kW;

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

14) ‘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;

15) ‘fossil fuel’ means a gaseous or liquid fuel of fossil origin;

16) ‘solid fuel’ means a fuel which is solid at normal indoor room temperatures, including biomass and fossil fuel;

17) ‘rated heating output’ ($P_{rated,h}$) means the heating capacity of a heat pump when providing space heating at 'standard rating conditions', expressed in kW;

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

19) ‘standard rating conditions’ means the operating conditions of chillers, air conditioners and heat pumps while establishing the rated heating output, rated cooling output, rated energy efficiency ratio (EER_{rated}), rated coefficient of performance (COP_{rated}), sound power level and emissions of nitrogen oxides;

20) ‘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.

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

      iv) air-to-air heat pumps, comfort chillers, air-to-air air conditioners and fan coil units shall correspond to the requirements as indicated in Annex II, point 4) a) and 6);

   b) From 1 January 2018:

      i) 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 2019:

      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-to-air heat pumps, comfort chillers, air-to-air air conditioners and fan coil units shall correspond to the requirements as indicated in Annex II, point 4) b);

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

Chapter 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 product information set out in point 6 of Annex II to this Regulation.

Chapter 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.

Chapter 6

Benchmarks

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

Chapter 7

Review

The Commission shall review this Regulation in the light of technological progress of air heating products and cooling products and present the result of this review to the Ecodesign Consultation Forum no later than 1 January 2020. In particular, the review shall include an assessment of the following aspects:

1) the appropriateness of setting ecodesign requirements for greenhouse gas emissions attributable to refrigerant leakage;

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;

Chapter 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 comfort chillers, air conditioners and fan coils, which are in conformity with the national provisions on maximum sound power level in force upon adoption of this Regulation;

4) Until 1 January 2018 Member States may allow the placing on the market and/or putting into service of air heating products, heat pump heaters, chillers and air conditioners, which are in conformity with the national provisions on emissions of nitrogen oxides in force upon adoption of this Regulation.

Chapter 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:

Generic 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 1 to Regulation (EC) No 842/2006;

   for fluorinated refrigerants, the GWP values shall be those published in the Third Assessment Report (TAR), adopted by the Intergovernmental Panel on Climate Change[8] (2007 IPCC GWP values for a 100-year period);

   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 I of the Regulation 842/2006;

   for refrigerants not included in the above references, the IPCC UNEP 2010 report on Refrigeration, Air Conditioning and Heat Pumps, dated February 2011, 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 or outdoors, expressed in dB;

6) 'supplementary heater' means a heat generator of the air heating product that generates supplemental heat during operating conditions the heat demand exceeds the heat output 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;

---

7 OJ L 315, 14.11.2012, p.1.

8 IPCC Fourth Assessment Climate Change 2007. A Report of the Intergovernmental Panel on Climate Change: http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml

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

8) ‘seasonal space heating energy efficiency’ ($\eta_{s,h}$) means the ratio between the space heating demand pertaining to a designated heating season provided by an air heating product, and the annual energy consumption required for its generation, expressed in %;

9) ‘seasonal space cooling energy efficiency’ ($\eta_{s,c}$) means the ratio between the space cooling demand pertaining to a designated cooling season provided by a cooling product, and the annual energy consumption required for its generation, 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);

Definitions related to warm air heaters:

11) ‘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;

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

13) ‘electric warm air heater’ means an air heating product that uses a heat generator using the Joule effect in resistance heating;

14) ‘nominal load’ means the maximum heating capacity of the warm air heater (P_{nom}), expressed in kW.

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

16) ‘useful efficiency at nominal load’ ($\eta_{\_nom}$) means the ratio of the heat output at nominal load and the total energy input to achieve this heat output, expressed in %, whereby the total energy input is based on the GCV of the fuel;

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

18) ‘seasonal space heating energy efficiency in active mode’ ($\eta_{s,on}$) means the weighted average of the useful efficiency at nominal load, and of the useful efficiency at minimum load, expressed in %;

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

20) ‘auxiliary power losses’ means the losses in seasonal energy efficiency due to electric power consumption at nominal load (el_{max}), at minimum load (el_{min}) and in standby mode;

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

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

23) ‘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;

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

Definitions related to product definitions 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, ground or waste 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) rejects this heat to an air-based heating system,

   d) which may be equipped with a supplementary heater using the Joule effect in electric resistance heating elements or the combustion of fossil fuels;

   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 fuel combustion engine and whereby the outdoor heat exchanger (evaporator) allows heat transfer from ambient air;

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

28) ‘sorption cycle heat pump’ means a heat pump which has a heat generator that uses a sorption cycle;

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 cooling 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 cooling generator that uses a vapour compression cycle driven by an electric motor or fuel 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 cooling generator that uses a vapour compression cycle driven by an electric motor or fuel combustion engine and whereby the outdoor heat exchanger (condenser) allows heat transfer to water or brine;

32) ‘sorption cycle air conditioner’ means an air conditioner which has a cooling generator that uses a sorption cycle;

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

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

35) ‘sorption cycle chiller’ means a comfort chiller that has a cooling generator that uses a sorption cycle;

36) ‘cooling only chiller’ means a comfort chiller that cannot operate in reverse and thus can only provide in cooling;

37) ‘condensing unit’ means an cooling product:

a) which when placed on the market is not equipped with an indoor heat exchanger (evaporator) to extract heat from indoor spaces and therefore requires, before putting into service, the addition of an evaporator;

b) has a cooling 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);

d) may or may not operate in reverse;

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

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

39) ‘outdoor temperature’ (T_j) means the dry bulb outdoor air temperature, expressed in degrees Celsius, of which the relative humidity can be indicated by a corresponding wet bulb temperature;

40) ‘rated coefficient of performance’ (COP_{rated}) or ‘rated primary energy heating ratio’ ($PER_{rated,h}$) means the 'rated capacity' for heating, expressed in kW, divided by the energy input, expressed in kW in terms of GCV and/or in kW in terms of electric energy, when providing heating at standard rating conditions;

41) ‘rated energy efficiency ratio’ (EER_{rated}) or ‘rated primary energy cooling ratio’ ($PER_{rated,c}$) means the 'rated capacity' for cooling, expressed in kW, divided by the energy input for cooling, expressed in kW in terms of GCV and/or in kW in terms of electric energy, when providing cooling at standard rating conditions;

42) ‘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 25;

43) ‘reference design temperature’ means the ‘outdoor temperature’ for either cooling ($T_{design,c}$) or heating ($T_{design,h}$) as described in Annex III, Table 25, at which the ‘part load ratio’ shall be equal to 1 and which varies according to the designated cooling or heating season, expressed in degrees Celsius;

44) 'bivalent temperature' (T_{biv}) means the outdoor temperature (T_j) declared by the manufacturer for heating at which the declared capacity for heating equals the part load for heating and below which the declared capacity for heating has to be supplemented with electric back up heater / supplementary capacity in order to meet the part load for heating, expressed in degrees Celsius;

45) '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 capacity for heating is equal to zero, expressed in degrees Celsius;

46) '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;

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

48) 'bin' (bin_j) means a combination of an 'outdoor temperature (T_j)' and 'bin hours (h_j)', as set out in Annex III, Table 26;

49) '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 26;

50) '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;

51) '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;

52) 'seasonal energy efficiency ratio' (SEER) or 'seasonal cooling primary energy ratio' ($SPER_{cool}$) 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';

53) 'seasonal coefficient of performance' (SCOP) or 'seasonal primary energy ratio' ($SPER_{heat}$) is the overall coefficient of performance of a heat pump using electricity or the overall primary energy ratio of a heat pump air heater using fuels, representative for the designated heating season, calculated as the reference annual heating demand divided by the reference annual energy consumption;

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

55) '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 SCOP or $SPER_{heat}$ 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;

56) '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' ($SEER_{on}$ or $SPER_{cool,on}$) and the electricity consumption

of the unit for thermostat off-, standby-, off- and crankcase heater-mode during the cooling season, expressed in kWh;

57) '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' ($SCOP_{on}$ or $SPER_{heat,on}$) and the electricity consumption of the unit for thermostat off-, standby-, off- and crankcase heater-mode during the cooling season expressed in kWh;

58) '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;

59) '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;

60) 'active mode seasonal energy efficiency ratio' ($SEER_{on}$) or 'active mode cooling primary energy ratio' ($SPER_{cool,on}$) 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;

61) 'active mode coefficient of performance' ($SCOP_{on}$) or 'active mode primary energy ratio' ($SPER_{heat,on}$) 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 ($COP_{bin}(T_j)$ or $PER_{heat,bin}(T_j)$)and weighted by the bin hours the bin condition occurs;

62) 'supplementary capacity for heating' ($sup(T_j)$) means the rated heat output P_{sup} of a supplementary heater that supplements the declared capacity for heating to meet the part load for heating in case the declared capacity for heating is less than the part load for heating, expressed in kW;

63) 'bin-specific coefficient of performance' ($COP_{bin}(T_j)$) or 'bin-specific primary energy ratio' ($PER_{heat,bin}(T_j)$) 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 ($COP_d(T_j)$ or $PER_{heat,d}(T_j)$) for specified bins (j) and calculated for other bins through inter/extrapolation, when necessary corrected by the degradation coefficient;

64) '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 degradation coefficient;

65) 'declared capacity for heating' ($Pdh(T_j)$) means the 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;

66) 'declared capacity for cooling' ($Pdc(T_j)$) means the 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;

67) 'capacity control' means the ability of a chiller, air conditioner or heat pump to change its capacity by changing the volumetric flow rate of at least one of the fluids needed to operate the refrigeration cycle, to be indicated as 'fixed' if the volumetric flow rate cannot

be changed or 'variable' if the volumetric flow rate is changed or varied in series of two or more steps;

68) 'design load for heating' ($P_{designh}$) means the rated heat output (P_{ratedh}) of 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 Tdesignh, expressed in kW;

69) 'design load for cooling' ($P_{designc}$) means the rated cooling power (Prated) of a chiller or air conditioner at the reference design temperature, whereby the design load for cooling $P_{designc}$ is equal to the part load for cooling with outdoor temperature Tj equal to reference design temperature $T_{designc}$, expressed in kW;

70) 'declared coefficient of performance' ($COP_d(T_j)$) or 'declared primary energy ratio' ($PER_{heat,d}(T_j)$) means the coefficient of performance or primary energy ratio at a limited number of specified bins with outdoor temperature;

71) 'declared energy efficiency ratio' ($EER_d(T_j)$ or $PER_{cool,d}(T_j)$) means the energy efficiency ratio at a limited number of specified bins (j) with outdoor temperature (T_j);

72) 'cycling interval capacity for heating' (P_{cych}) means the integrated heating capacity over the cycling test interval for heating, expressed in kW;

73) 'cycling interval capacity for cooling' (P_{cycc}) means the integrated cooling capacity over the cycling test interval for cooling, expressed in kW;

74) 'cycling interval efficiency for heating' (COP_{cych} or PER_{cych}) means the average coefficient of performance over the cycling test interval, calculated as the integrated heating capacity over the interval, expressed in kWh, divided by the integrated energy input over that same interval, expressed in kWh in terms of GCV and/or in kWh in terms of final energy;

75) 'cycling interval efficiency for cooling' (EER_{cycc} or PER_{cycc}) means the average coefficient of performance over the cycling test interval, calculated as the integrated heating capacity over the interval, expressed in kWh, divided by the integrated energy input over that same interval, expressed in kWh in terms of GCV and/or in kWh in terms of final energy;

76) 'degradation coefficient' (Cd) means the measure of efficiency loss due to cycling of a chiller, air conditioner or heat pump; if Cd is not determined by measurement then the default degradation coefficient shall be Cd = 0,9;

77) 'electric back-up heater 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 capacity for heating (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;

78) '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;

Operating modes for calculation of seasonal energy efficiency of chillers, air conditioners and heat pumps:

79) '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;

80) ‘standby mode’ means a condition where the 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;

81) ‘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;

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

83) ‘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[10];

84) ‘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;

85) ‘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;

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

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

88) ‘standby mode power consumption’ (el_{sb}) means the power consumption of the unit while in standby mode, expressed in kW;

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

90) ‘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;

91) ‘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;

92) ‘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;

93) ‘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 high temperature process chillers

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

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

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

96) ‘rated cooling capacity’ (P_A) means the cooling capacity which the process chiller is capable to reach, when operating at full load, and measured at standard rating conditions with the reference ambient temperature at 35°C for air-cooled chillers and 30°C for water-cooled chillers, expressed in kW at three decimal places;

97) ‘rated power input’ (D_A) means the electrical power input which is needed by the process chiller to reach the rated cooling capacity, expressed in kW at three decimal places;

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

99) ‘seasonal energy performance ratio’ (SEPR) is the efficiency ratio of a process chiller for providing cooling at standard rating conditions, representative of the variations in load and ambient temperature throughout the year, and calculated as the ratio between the annual cooling demand and the annual electricity consumption;

100) ‘annual cooling demand’ means the sum of each bin-specific cooling demand multiplied by the corresponding number of bin hours;

101) ‘bin-specific cooling demand’ means the rated cooling capacity multiplied by the part load ratio, for every bin in the year, expressed in kW at three decimal places;

102) ‘part load’ ($P_R(Tj)$) means the cooling load at a specific ambient temperature, calculated as the full load multiplied by the part load ratio;

103) ‘part load ratio’ ($P_L(Tref)$) means :

a) for process chillers using air-cooled condensing, the ambient temperature minus 5 ºC divided by the reference ambient temperature minus 5 ºC. For ambient temperatures higher than the reference ambient temperature, the part load ratio shall be 1. For ambient temperatures lower than 5°C, the part load ratio shall be 0.8;

b) for process chillers using water-cooled condensing, the ambient temperature minus 9°C divided by the reference ambient temperature minus 9°C. For ambient temperatures higher than the reference ambient temperature, the part load ratio shall be 1. For ambient temperatures lower than 9°C, the part load ratio shall be 0.8;

104) ‘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;

105) ‘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;

106) ‘reference ambient temperature’ means the ambient temperature, expressed in degrees Celsius, at which the part load ratio is equal to 1. It shall be set at 35°C for air-cooled process chillers and 30°C for water-cooled process chillers;

107) ‘bin-specific energy efficiency ratio’ (EERj) means the energy efficiency ratio for every bin in the year, derived from the part load, the declared cooling demand and

declared energy efficiency ratio for specified bins and calculated for other bins by linear interpolation, corrected where necessary by the degradation coefficient;

108) ‘declared cooling demand’ means the cooling demand at a limited number of specified bins, and calculated as the rated cooling capacity multiplied by the corresponding part load ratio;

109) ‘declared energy efficiency ratio’ means the energy efficiency ratio at a limited number of specified bins;

110) ‘declared power input’ means the electrical power input needed by the process chiller to meet the declared cooling capacity;

111) ‘declared cooling capacity’ means the cooling capacity delivered by the chiller to meet the declared cooling demand;

112) ‘degradation coefficient’ (Cc) means the measure of efficiency loss due to cycling of process chillers at part load; if Cc is not determined by measurement, then the default degradation coefficient is Cc = 0,9;

113) ‘capacity control’ means the ability of a process chiller to change its capacity by changing the volumetric flow rate of at least one of the fluids needed to operate the refrigeration cycle, to be indicated as ‘fixed’ if the volumetric flow rate cannot be changed or ‘variable’ if the volumetric flow rate is changed or varied in series of two or more steps.

Annex II

Ecodesign requirements

1) Seasonal space heating 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
Air-to-air heat pump, driven by an electric motor	141
Air-to-air heat pump, driven by a fuel driven engine	137

   b) From 1 January 2019 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	146
Air-to-air heat pump, driven by a fuel driven engine	142

2) Seasonal space cooling 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 > 675	GWP ≤ 675
Air-to-water chiller with rated output < 400 kW, when driven by an electric motor	157	141
Air-to-water chiller with rated output ≥ 400 kW when driven by an electric motor	173	156
Water/brine to-water chiller with rated output < 400 kW when driven by an electric motor	196	176
Water/brine to-water -cooled chiller with rated output ≥ 400 kW when driven by an electric motor	256	230
Air-to-water chiller with rated output < 400 kW, when driven by a fuel driven motor	142	128
Air-to-air conditioner, driven by an electric motor	181	163
Air-to-air air conditioner, driven by an fuel driven motor	167	150

   b) From 1 January 2019 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 > 675	GWP < 675
Air-to-water chiller with rated output < 400 kW, when driven by an electric motor	161	145
Air-to-water chiller with rated output ≥ 400 kW when driven by an electric motor	185	167
Water/brine to-water chiller with rated output < 400 kW when driven by an electric motor	200	180
Water/brine to-water -cooled chiller with rated output ≥ 400 kW when driven by an electric motor	272	245
Air-to-water chiller with rated output < 400 kW, when driven by a fuel driven motor	147	132
Air-to-air conditioner, driven by an electric motor	189	170
Air-to-air air conditioner, driven by an fuel driven motor	177	159

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 %

	SEPR
Air-cooled high temperature process chiller with rated output < 400 kW	4.5
Air-cooled high temperature process chiller with rated output ≥ 400 kW	5.0
Water-cooled high temperature process chiller with rated output < 400 kW	6.5
Water-cooled high temperature process chiller with rated output ≥ 400 kW and < 1000 kW	7.5
Water-cooled high temperature process chiller ≥ 1000 kW	8.0

   b) From 1 January 2019 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 %

	SEPR
Air-cooled high temperature process chiller with rated output < 400 kW	5.0
Air-cooled high temperature process chiller with rated output ≥ 400 kW	5.5
Water-cooled high temperature process chiller with rated output < 400 kW	7.0
Water-cooled high temperature process chiller with rated output ≥ 400 kW and < 1000 kW	8.0
Water-cooled high temperature process chiller ≥ 1000 kW	8.5

4) Sound power level of comfort chillers, air-to-air air conditioners, air-to-air heat pumps and fan coil units:

   a) From 1 January 2017 the sound power level of comfort chillers, air-to-air air conditioners, air-to-air heat pumps and fan coil units shall not exceed the values in Table 7:

Table 7

First tier maximum sound power levels, expressed in dB

Product by rated cooling or heating output	Outdoor side
rated output < 6 kW	64
rated output > 6 kW and < 12 kW	69
rated output ≥ 12 kW and < 30 kW	74 / 79*
rated output ≥ 30 kW and < 70 kW	84
	Non-ducted Indoor side**
rated output < 6 kW	59
rated output > 6 kW and < 12 kW	64
rated output ≥ 12 kW and < 30 kW	69
rated output ≥ 30 kW and < 70 kW	79
	Ducted Indoor side **
rated output < 6 kW	59
rated output ≧ 6 kW and < 12 kW	64
rated output ≥ 12 kW and < 17.5 kW	69
rated output ≥ 17.5 kW and < 40 kW	79
rated output ≥ 40 kW and < 70 kW	84

* for packaged products the value is increased by 5 dB

** indoor noise requirements shall not apply to comfort chillers

b) From 1 January 2019 the sound power level of cooling only comfort chillers, air-to-air air conditioners, air-to-air heat pumps and fan coil units shall not exceed the values in Table 8:

Table 8

Second tier maximum sound power levels, expressed in dB

Product by rated cooling or heating output	Outdoor side
rated output < 6 kW	63
rated output > 6 kW and < 12 kW	68*
rated output ≥ 12 kW and < 30 kW	73 / 78*
rated output ≥ 30 kW and < 70 kW	83
	Non-ducted indoor side**
rated output < 6 kW	58
rated output > 6 kW and < 12 kW	63
rated output ≥ 12 kW and < 30 kW	68
rated output ≥ 30 kW and < 70 kW	78
	Ducted indoor side**
rated output < 6 kW	58
rated output ≧ 6 kW and < 12 kW	63
rated output ≥ 12 kW and < 17.5 kW	68
rated output ≥ 17.5 kW and < 40 kW	78
rated output ≥ 40 kW and < 70 kW	83

* for packaged products the value is increased by 5 dB

** indoor noise requirements shall not apply to chillers

5) Emissions of nitrogen oxides:

a) From 1 January 2018 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 9:

Table 9

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

Warm air heaters using gaseous fuels	70
Warm air heaters using liquid fuels	120
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	240
Heat pumps, comfort chillers, high temperature chillers and air conditioners, equipped with internal combustion engines using liquid fuels	420

6) Product information:

a) From 1 January 2017 the following product information related to air heating products or cooling products shall be provided:

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

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

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

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

v) For water/brine-to air air conditioners, the information set out in Table 13 of this Annex, measured and calculated in accordance with Annex III;

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

vii) For heat pumps, the information set out in Table 15 of this Annex, measured and calculated in accordance with Annex III;

viii) For high temperature process chillers, the information set out in Table 16 of this Annex, measured and calculated in accordance with Annex III

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

x) 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;

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

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

i) the elements specified in point (a);

ii) where the information relating to a specific heat pump heater model or air conditioner, being a combination of indoor and outdoor unit(s), 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;

Table 10

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			
Nominal capacity	P_{nom}	x,x	kW	Useful efficiency at nominal 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 nominal capacity	el_{max}	x,x	kW	Envelope loss	P_{env}	x,x	kW
At minimal capacity	el_{min}	x,x	kW	Pilot flame power *	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 11

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 output	Prated	x,x	kW	Seasonal space cooling energy efficiency (SEER or SPERcool)	ηs	x,x	%
Declared capacity for cooling for part load at given outdoor temperatures Tj				Declared (primary) energy efficiency ratio for part load at given outdoor temperatures Tj			
Tj = +35 ºC	Pdc	x,x	kW	Tj = +35 ºC	EERd or PERcoold	x,x	%
Tj = + 30 ºC	Pdc	x,x	kW	Tj = + 30 ºC	EERd or PERcoold	x,x	%
Tj = + 25 ºC	Pdc	x,x	kW	Tj = + 25 ºC	EERd or PERcoold	x,x	%
Tj = + 20 ºC	Pdc	x,x	kW	Tj = + 20 ºC	EERd or PERcoold	x,x	%
Cycling interval capacity for heating	Pcycc	x,x	kW	Cycling interval efficiency	EERd or PERcoold	x,x	%
Degradation co-efficient**	Cdc	x,x	-				
Power consumption in modes other than 'active mode'							
Off mode	P_{OFF}	x,x	kW				
Thermostat-off mode	P_{TO}	x,x	kW				
Crankcase heater mode	P_{CK}	x,x	kW				
Other items							
Capacity control	fixed/variable			For air-to-water chillers: Rated air flow rate, outdoor measured	-	x	m³/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	m³/h
Emissions of nitrogen oxides	NOx	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 shall be Cdc = 0,9.							

Table 12

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 fuel driven]							
Parameters shall be declared for average cooling season							
Item	Symbol	Value	Unit	Item	Symbol	Value	Unit
Rated cooling output	Prated	x,x	kW	Seasonal space cooling energy efficiency (SEER or SPERcool)	ηs	x,x	%
Declared capacity for cooling for part load at given outdoor temperatures Tj and indoor 27°/19°C (dry/wet bulb)				Declared (primary) energy efficiency ratio for part load at given outdoor temperatures Tj			
Tj = +35 °C	Pdc	x,x	kW	Tj = +35 °C	EERd or PERcoold	x,x	%
Tj = + 30 °C	Pdc	x,x	kW	Tj = + 30 °C	EERd or PERcoold	x,x	%
Tj = + 25 °C	Pdc	x,x	kW	Tj = + 25 °C	EERd or PERcoold	x,x	%
Tj = + 20 °C	Pdc	x,x	kW	Tj = + 20 °C	EERd or PERcoold	x,x	%
Cycling interval capacity for heating	Pcycc	x,x	kW	Cycling interval efficiency	EERd or PERcoold	x,x	%
Degradation co-efficient**	Cdc	x,x	-				
Power consumption in modes other than 'active mode'							
Off mode	P_{OFF}	x,x	kW				
Thermostat-off mode	P_{TO}	x,x	kW				
Crankcase heater mode	P_{CK}	x,x	kW				
Other items							
Capacity control	fixed/variable			For air-to-water chillers: Rated 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				
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 shall be Cdc = 0,9.							

Table 13

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 output			Prated	x,x	kW	Seasonal space cooling energy efficiency (SEER or SPERcool)		ηs	x,x	%
Declared capacity for cooling for part load at given outdoor temperatures Tj and indoor 27°/19°C (dry/wet bulb)						Declared (primary) energy efficiency ratio 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 PERcoold	x,x	%
Tj = + 30 °C	26/*	10/*	Pdc	x,x	kW	Tj = + 30 °C		EERd or PERcoold	x,x	%
Tj = + 25 °C	22/*	10/*	Pdc	x,x	kW	Tj = + 25 °C		EERd or PERcoold	x,x	%
Tj = + 20 °C	18/*	10/*	Pdc	x,x	kW	Tj = + 20 °C		EERd or PERcoold	x,x	%
Cycling interval capacity for heating			Pcycc	x,x	kW	Cycling interval efficiency		EERd or PERcoold	x,x	%
Degradation co-efficient**			Cdc	x,x	-					
Power consumption in modes other than 'active mode'										
Off mode			P_{OFF}	x,x	kW					
Thermostat-off mode			P_{TO}	x,x	kW					
Crankcase heater mode			P_{CK}	x,x	kW					
Other items										
Capacity control			fixed/variable							
Sound power level, outdoor			LWA	x,x / x,x	dB	For water-/brine-to-water chillers: Rated brine or water flow rate, outdoor heat exchanger		-	x	m^3/h
if engine driven Emissions of nitrogen oxides			NOx	x	mg/kWh					
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 shall be Cdc = 0,9.

Table 14

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 output (sensible)	Prated	x,x	W	Electricity consumption	Pon	x,x	W
Cooling output (latent)	Prated,	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 15

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 heat output*	Prated	x,x	kW	Seasonal space heating energy efficiency	ηs	x,x	%
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj				Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Tj = - 7 ºC	Pdh	x,x	kW	Tj = - 7 ºC	COPd or PERd	x,x	%
Tj = + 2 ºC	Pdh	x,x	kW	Tj = + 2 ºC	COPd or PERd	x,x	%
Tj = + 7 ºC	Pdh	x,x	kW	Tj = + 7 ºC	COPd or PERd	x,x	%
Tj = + 12 ºC	Pdh	x,x	kW	Tj = + 12 ºC	COPd or PERd	x,x	%
Tj = bivalent temperature	Pdh	x,x	kW	Tj = bivalent temperature	COPd or PERd	x,x	%
Tj = operation limit	Pdh	x,x	kW	Tj = operation limit	COPd or PERd	x,x	%
For air-to-water heat pumps: Tj = - 15 ºC (if TOL < - 20 ºC)	Pdh	x,x	kW	For air-to-water heat pumps: Tj = - 15 ºC (if TOL < -20 ºC)	COPd or PERd	x,x	%
Bivalent temperature	Tbiv	x	ºC	For air-to-water heat pumps: Operation limit temperature	TOL	x	ºC
Cycling interval capacity for heating	Pcych	x,x	kW	Cycling interval efficiency	COPcyc or PERcyc	x,x	%
Degradation co-efficient**	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	Rated heat output*	Psup	x,x	kW
Thermostat-off mode	P_{TO}	x,x	kW	Type of energy input			
Crankcase heater mode	P_{CK}	x,x	kW				
Other items							
Capacity control	fixed/variable			For air-to-water heat pumps: Rated 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				
For heat pump combination heater:							
Declared load profile	x			Water heating energy ηwh		x,x	%

Daily electricity consumption	Qelec	x,xxx	kWh/day		efficiency Daily fuel consumption Qfuel	x,xxx	kWh/day
Contact details	Name and address of the manufacturer or of its authorised representative.						
* For heat pump space heaters and heat pump combination heaters, the rated heat output Prated is equal to the design load for heating Pdesignh, and the rated heat output of a supplementary heater Psup is equal to the supplementary capacity for heating sup(Tj).							
** If Cdh is not determined by measurement then the default degradation coefficient shall be Cdh = 0,9.							

Table 16

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	x	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 cooling capacity	P_A	x,xxx	kW
Rated power input	D_A	x,xxx	kW
Rated EER	EER_A	x,xx	[-]
Parameters at rating point B			
Rated cooling capacity	P_B	x,xxx	kW
Rated power input	D_B	x,xxx	kW
Rated EER	EER_B	x,xx	[-]
Parameters at rating point C			
Rated cooling capacity	P_C	x,xxx	kW
Rated power input	D_C	x,xxx	kW
Rated EER	EER_C	x,xx	[-]
Parameters at rating point D			
Rated cooling capacity	P_D	x,xxx	kW
Rated power input	D_D	x,xxx	kW
Rated EER	EER_D	x,xx	[-]
Other items			
Capacity control	fixed/staged**/variable		
Degradation co-efficient*	Cd	x,xx	[-]
Contact details	Name and address of the manufacturer or of its authorised representative.		
* If Cd is not determined by measurement then the default degradation coefficient shall be Cd = 0,9. If the default Cd 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 heat output, seasonal space heating energy efficiency, sound power level and emissions of nitrogen oxides shall take account of the supplementary heater;

   d) Declared values of rated heat output, rated cooling output, seasonal space heating energy efficiency, seasonal space cooling energy efficiency, sound power level and emissions of nitrogen oxides shall be rounded to the nearest integer;

   e) 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.

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

4) Seasonal space cooling energy efficiency of comfort chillers and 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 energy efficiency ratio EER_{rated} or rated primary energy ratio PER_{rated}, the sound power level or the emissions of nitrogen oxides, the operating conditions shall be the standard rating conditions set out in table 17 (air-to-air air conditioners), table 18 (water-cooled comfort chillers), table 19 (air-cooled comfort chillers), table 20 (water/brine-to-air air conditioners);

   c) The active mode seasonal energy efficiency ratio $SEER_{on}$ or active mode primary energy ratio $SPER_{cool,on}$ shall be calculated on the basis of the part load for cooling load $Ph(T_j)$ and the bin-specific energy efficiency ratio $EER_{bin}(T_j)$ or bin-specific

primary energy ratio $PER_{cool,bin}(T_j)$, and weighted by the bin-hours the bin conditions occurs, using the following conditions:

i) the reference design conditions set out in Table 25;

ii) the European reference average cooling season set out in Table 27;

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

iv) The reference annual cold 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 29;

v) The reference 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 $SEER_{on}$, or active mode primary energy ratio $SPER_{cool,on}$ and

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

vi) The seasonal energy efficiency ratio SEER or seasonal primary energy ratio $SPER_{cool}$ 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 η_s shall be calculated as the seasonal energy efficiency ratio SEER divided by the conversion coefficient CC or the seasonal primary energy ratio SPER, corrected by contributions accounting for temperature controls and, for water-cooled chillers only, the electricity consumption of ground water pump(s).

5) Seasonal space heating energy efficiency of 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 rated coefficient of performance COP_{rated} or rated primary energy ratio PER_{rated}, the sound power level or the emissions of nitrogen oxides, the operating conditions shall be the standard rating conditions set out in table 17 (air-to-air heat pumps), table 20 (water/brine-to-air heat pumps);

c) The active mode coefficient of performance $SCOP_{on}$ or active mode primary energy ratio $SPER_{heat,on}$ shall be calculated on the basis of the part load for heating Ph(Tj), the supplementary capacity for heating $sup(T_j)$ (if applicable) and the bin-specific coefficient of performance $COPbin(T_j)$ or bin-specific primary energy ratio PER_{heat},$bin(T_j)$ and weighted by the bin-hours the bin conditions occurs, using the following conditions:

i) the reference design conditions set out in Table 25;

ii) the European reference 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 heating capacity;

iv) The reference annual heat demand Q_H or cold demand Q_C, shall be the design load for heating $P_{designh}$ or cooling $P_{designc}$ multiplied by the annual equivalent active mode hours HHE is set out in Table 6;

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

(1) the ratio of the reference annual heating demand Q_H and the active mode coefficient of performance $SCOP_{on}$ or active mode primary energy ratio $SPER_{heat,on}$ and;

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

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

vii) The seasonal space heating energy efficiency η_s shall be calculated as the seasonal coefficient of performance SCOP divided by the conversion coefficient CC or the seasonal primary energy ratio SPER, corrected by contributions accounting for temperature controls;

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

For establishing the values of cooling capacity, power input, energy efficiency ratio and 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 chillers and 30°C for water-cooled chillers

b) the outlet temperature of the liquid at the indoor heat exchanger shall be 6°C

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 28

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 17

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	Outside air / recycled air	7	6	20	15 max
	Exhaust air / outdoor air	20	12	7	6
Cooling mode	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 18

Standard rating conditions for water-cooled 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 19

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

		Outdoor heat exchanger		Indoor heat exchanger	
		inlet temperature °C	outlet temperature °C	inlet temperature °C	outlet temperature °C
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 20

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

		Outdoor heat exchanger		Indoor heat exchanger	
		inlet temperature °C	outlet temperature °C	inlet dry bulb temperature °C	inlet wet bulb temperature °C
Heating mode	water	10	7	20	15 max
	brine	0	-3 a	20	15 max
	water loop	20	17*	20	15 max
Cooling mode	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 21

Standard rating conditions for high temperature process chillers

Test point	**Part load ratio**	**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 22

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 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 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	33%	+7(+6)		20		
+12	18%	+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	33%	10/*	0/*	20
+12	18%	10/*	0/*	20
TOL	depends on TOL	10/*	0/*	20
Tbiv	depends on Tbiv	10/*	0/*	20

* with 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 (Tinlet+Toutlet/0.5) during testing shall be the specified outlet temperatures corrected with a value of +2.5 (e.g use tmean 11 instead of 8.5)

Table 23

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

Test point	Part load ratio	Part load ratio (%)	Outdoor heat exchanger	Indoor heat exchanger
			inlet air temperature (°C)	Evaporator inlet/outlet water temperatures (°C)
				Fixed outlet
A	$80\% + 20\% \cdot (T_A-T_D)/(T_A-T_D)$	100%	35	12/ 7
B	$80\% + 20\% \cdot (T_B-T_D)/(T_A-T_D)$	93%	25	* / 7
C	$80\% + 20\% \cdot (T_C-T_D)/(T_A-T_D)$	87%	15	* / 7
D	$80\% + 20\% \cdot (T_D-T_D)/(T_A-T_D)$	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 24

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

Test point	Part load ratio	Part load ratio (%)	Outdoor heat exchanger	Indoor heat exchanger
			Inlet/ outlet water temperatures (°C)	Evaporator Inlet / outlet water temperatures (°C)
				Fixed outlet
A	$80\% + 20\%*(T_A-T_D)/(T_A-T_D)$	100%	30 / 35	12/ 7
B	$80\% + 20\%*(T_B-T_D)/(T_A-T_D)$	93%	23 / [a]	* / 7
C	$80\% + 20\%*(T_C-T_D)/(T_A-T_D)$	87%	16 / [a]	* / 7
D	$80\% + 20\%*(T_D-T_D)/(T_A-T_D)$	80%	9 / [a]	* / 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 25

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

Function		Reference design temperature dry bulb (wet bulb)		
		$T_{designc}$		
Cooling	Average	35 (24) °C		
		Reference design temperature	Bivalent temperature maximum	Operation limit temperature maximum
		$T_{designh}$	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 26

European reference heating season under average climate conditions

binj	Tj [°C]	Hj [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 27

European reference cooling season for 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		h		h	
1	17	205	EERD	182	EERD	130	EERD
2	18	227	EERD	148	EERD	170	EERD
3	19	225	EERD	121	D - Measured value	214	EERD
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	EERA	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	EERA			18	EERA
21	37	4	EERA			11	EERA
22	38	3	EERA			6	EERA
23	39	1	EERA			3	EERA
24	40	0	EERA			2	EERA

Table 28

European reference cooling 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 29

Operational hours per functional mode for 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 (SEER)	Average	600	659	1377	0	2036
	Colder	300	436	828	0	1264
	Warmer	900	767	1647	0	2414
Heating (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

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 heat output 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 heat output 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 6 % at the rated heat output of the unit, with point A measured at the rated cooling capacity;

      ii) the rated energy efficiency ratio (EER_A) is not more than 5 % lower than the declared value, measured at the rated cooling 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 heat output 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 heat output 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 heat output of the unit, with point A measured at the rated cooling capacity;

ii) the average of the three units for the rated energy efficiency ratio (EERA) 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) 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;

5) 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 heaters in terms of seasonal space heating energy efficiency, water heating energy efficiency, sound power level and emissions of nitrogen oxides was identified as follows:

1) Benchmarks for seasonal energy efficiency or air heating products and cooling products are described in Table 27;

Table 30

Benchmark for seasonal energy efficiency of air heating products and cooling products

Warm air heaters using gaseous or liquid fuels	84%
Warm air heaters using electricity	34%
Air-cooled chillers < 200 kW	209%
Air-cooled chillers ≥ 200 kW	225%
Water cooled chillers < 200 kW	272%
Water cooled chillers ≥ 200 kW	352%
Air-to-air air conditioner	257%
Heat pump	177%
High temperature process chiller, air cooled, P_A < 200 kW	6.5 SEPR
High temperature process chiller, air cooled, 200 kW ≤ P_A < 400 kW	8.0 SEPR
High temperature process chiller, air cooled, P_A ≥ 400 kW	8.0 SEPR
High temperature process chiller, water cooled, P_A < 200 kW	8.5 SEPR
High temperature process chiller, water cooled, 200 kW ≤ P_A < 400 kW	12.0 SEPR
High temperature process chiller, water cooled, 400 kW ≤ P_A < 1000 kW	12.5 SEPR
High temperature process chiller, water cooled, P_A ≥ 1000 kW	13.0 SEPR

2) Benchmarks for sound power level (LWA) of the outdoor side of chillers, air conditioners and heat pumps are described in Table 28.

Table 31

Benchmark for sound power level, outdoor measured, of xx and of xx

Rated output ≤ 6 kW	60 dB
Rated output > 6 kW and ≤ 12 kW	65 dB
Rated output > 12 kW and ≤ 30 kW	70 /75*dB
Rated output > 30 kW and ≤ 70 kW	80 dB

* For packaged units the value is increased by 5 dB

3) Benchmarks for sound power level (LWAof the indoor side of air conditioners, heat pumps and fan coils if non-ducted are described in Table 29.

Table 32

Benchmark for sound power level

Rated output ≤ 6 kW	55 dB
Rated output > 6 kW and ≤ 12 kW	60 dB
Rated output > 12 kW and ≤ 30 kW	65 dB
Rated output > 30 kW and ≤ 70 kW	75 dB

4) Benchmarks for sound power level (LWA), of the indoor side of air conditioners, heat pumps and fan coils if ducted, are described in Table 30.

Table 33

Benchmark for sound power level of ducted air conditioners, heat pumps and fan coils

Rated output ≤ 6 kW	55 dB
Rated output > 6 kW and ≤ 12 kW	60 dB
Rated output > 12 kW and ≤ 17.5 kW	65 dB
Rated output > 17.5 kW and ≤ 40 kW	75 dB
Rated output > 40 kW and ≤ 70 kW	80 dB

5) 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 below 250 mg/kWh NO_x when measured at 5% O_2.

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