Working Document

in the framework of the implementation of:

Commission Regulation (EC) No XX/2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners and comfort fans

and of:

Commission delegated Regulation (EU) No XX/2009 implementing Directive 2010/30/EU of the European Parliament and of the Council on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products

(Text to be with EEA relevance)

(2011/X XX/XX)

1. Publication of titles and references of transitional methods of measurement[1] for the implementation of Regulation (EC) No XXX/2011 and, in particular, Annex II thereof, and for the implementation of delegated Regulation (EU) No XXX/2010 and, in particular, Annex VII thereof.

Measured parameter	Organisation	Reference	Title
Energy efficiency Ratio (EER), Coefficient of Performance (COP)	CEN	EN 14511:2007	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling
Energy efficiency Ratio (EER)	CEN	EN 15218:2006	Air conditioners and liquid chilling packages with evaporatively cooled condensor and with electrically driven compressors for space cooling
Test methods for SEER and SCOP	CEN	PrEN 14825:2009, version 113WG7 109	Air conditioners, liquid chilling packages and heat pumps, with electrical compressors, for space heating and cooling – Testing and rating at part load conditions and calculation

[1] It is intended that these transitional methods will ultimately be replaced by harmonised standard(s). When available, reference(s) to the harmonised standard(s) will be published in the *Official Journal of the European Union* in accordance with Articles 9 and 10 of Directive 2009/125/EC.

		rev, chapter 8 and 9	of seasonal performance
Standby power consumption	CEN	EN 62301:2005	Household Electrical Appliances: Measurement of standby power
Sound power level	CEN	EN 12102 :2008	Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling - Measurement of airborne noise - Determination of the sound power
Energy efficiency	IEC	IEC 60879: 1986 (corr. 1992)	Performance and construction of electric circulating fans and regulators
Sound power level	EN	EN 60704-2-7:1997	Household and similar electrical appliances - Test code for the determination of airborne acoustical noise - Part 2: Particular requirements for fans
Standby power consumption	CEN	EN 62301:2005	Household Electrical Appliances: Measurement of standby power

Calculation methods

for air conditioners (≤12kW) and comfort fans

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SECTION ONE - AIR CONDITIONERS

1 DEFINITIONS

Definitions relating to air conditioners:

(1) *'Air conditioner'* means a device capable of cooling or heating, or both, indoor air, using a vapour compression cycle driven by an electric compressor. The definition includes 'air conditioners' that provide additional functionalities such as dehumidification, air-purification, ventilation or supplemental air-heating by means of electric resistance heating. The definition also includes appliances that may use water (either condensate water that is formed on the evaporator side or externally added water) for evaporation on the condensor, provided that the device is also able to function without the use of additional water, using air only;

(2) *'Double duct'* means an 'air conditioner' in which, during cooling (heating), the condensor (evaporator) intake air is introduced from the outdoor environment to the unit by a duct and rejected to the outdoor environment by a second duct, and which is placed wholly inside the space to be conditioned, near a wall;

(3) *'Single duct'* means an 'air conditioner' in which, during cooling (heating), the condenser (evaporator) intake air is introduced from the space containing the unit and discharged outside this space;

(4) '*Standard rating conditions*' means the combination of *indoor (Tin)* and *outdoo*r *temperatures (Tj)* that describe the operating conditions while establishing the *rated capacity*, *sound power level*, *nominal air flow rate* and/or *rated energy efficiency ratio* (EER_{rated})*, rated coefficient of performance* (COP_{rated}) for cooling or heating, as described in table 4;

(5) '*Rated capacity*' *(Prated)* means the cooling capacity or heating capacity (depending on the specified function) of the vapour compression cycle of the unit at *standard rating conditions* for cooling or heating, as declared by the manufacturer;

(6) '*Indoor temperature*' (*Tin*) means the dry bulb indoor air temperature [°C] (with the relative humidity indicated by the corresponding wet bulb temperature;

(7) '*Outdoor temperature*' (*Tj*) means the dry bulb outdoor air temperature [ºC] of which relative humidity can be indicated by a corresponding wet bulb temperature;

(8) ‘*Rated energy efficiency ratio*’ (EER_{rated}) means the *declared capacity* for cooling [kW] divided by the *Rated power input for cooling* [kW] of a unit when providing cooling at *standard rating conditions*;

(9) ‘*Rated coefficient of performance*’ (COP_{rated}) means the *declared capacity* for heating [kW] divided by the *Rated power input for heating* [kW] of a unit when providing heating at *standard rating conditions*;

(10) ‘*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 CO2 equivalents over a 100 year time horizon. GWP values have to be determined based on the following:

“GWP values considered will be those set out in Annex 1 of Regulation (EC) No 842/2006 of the European Parliament and of the Council[2]*.*

For fluorinated refrigerants, the GWP values shall be those published in the third assessment report (TAR) adopted by the Intergovernmental Panel on Climate Change (2001 IPCC GWP values for a 100 year period)[3]*.*

For non-fluorinated gases, the GWP values are those published in the First IPCC assessment over a 100 year period[4]*.*

GWP values for mixtures of refrigerants shall be based on the formula stated in Annex I of the Regulation 842/2006.”;

(11) ‘*Off mode*’ is a condition in which the equipment (air conditioner or comfort fan) 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, as well as conditions providing only functionalities intended to ensure electromagnetic compatibility pursuant to Directive 2004/108/EC of the European Parliament and of the Council;

(12) ‘*Standby mode*’ means a condition where the equipment (air conditioner or comfort fan) 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

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2 OJ L 161, 14.6.2006, p. 1.

3 IPCC Third Assessment Climate Change 2001. A Report of the Intergovernmental Panel on Climate Change: http://www.ipcc.ch/pub/reports.htm.

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

function, or reactivation function and only an indication of enabled reactivation function, and/or information or status display;

(13) '*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;

(14) '*Information or status display'* is a continuous function providing information or indicating the status of the equipment on a display, including clocks;

(15) '*Sound power level'* means the A-weighted sound power level [dB(A)] indoors and/or outdoors measured at *standard rating conditions* for cooling (or heating, if the product has no cooling function);

(16) '*Reference design conditions*' means the combination of requirements for the *reference design temperature*, the maximum *bivalent temperature* and the maximum *operation limit temperature,* as described in Table 5;

(17) '*Reference design temperature*' means the *outdoor temperature* [ºC] for either cooling *(Tdesignc)* or heating *(Tdesignh)* as described in Annex I, Table 3, at which the *part load ratio* shall be equal to 1, and which varies according the designated cooling or heating *season.* See also the explanation of the concept provided in Annex A;

(18) '*Part load ratio'* (*pl(Tj)*) means the *outdoor temperature* minus 16ºC, divided by the *reference design temperature* minus 16ºC, for either cooling or heating;

(19) '*Season*' means one of four sets operating conditions (available for four seasons: *one cooling season, three heating seasons: average / colder / warmer*) describing per *bin* the combination of *outdoor temperatures* and the number of hours these temperatures occur per season the unit is declared fit for purpose;

(20) '*Bin*' (with index *j*) means a combination of an *outdoor temperature* (*Tj*) and *bin hours (hj)*, as described table 7;

(21) '*Bin hours*' means the hours per season *(hj)* the *outdoor temperature* occurs for each bin, as described in table 7;

(22) '*Seasonal energy efficiency ratio*' (*SEER*) is the overall energy efficiency ratio of the unit, representative for the whole cooling season, calculated as the

Reference annual cooling demand divided by the *Annual electricity consumption for cooling*;

(23) ‘*Reference annual cooling demand*’ (Q_C) means the reference cooling demand [kWh/a] to be used as basis for calculation of SEER and calculated as the product of the *design load for cooling* (*Pdesignc)* and the *equivalent active mode hours* for cooling *(*H_{CE});

(24) *‘Equivalent active mode hours for cooling’* (H_{CE}) means the assumed annual number of hours [hrs/a] the unit must provide the *design load for cooling* (Pdesignc) in order to satisfy the *Reference annual cooling demand*, as described in table 8;

(25) ‘*Annual electricity consumption for cooling*’ (Q_{CE}) means the electricity consumption [kWh/a] required to meet the *Reference annual cooling demand* and is calculated as the *Reference annual cooling demand* divided by the *active mode energy efficiency ratio* (*SEERon)* and the electricity consumption of the unit for *thermostat off*-, *standby*-, *off*- and *crankcase heater-mode* during the cooling season;

(26) ‘*Active mode energy efficiency ratio*’ (*SEERon*) 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 *(EERbin(Tj))* and weighted by the *bin hours* the *bin* condition occurs;

(27) ‘*Part load*’ means the cooling load (*Pc(Tj)*) or the heating load (*Ph(Tj)*) [kW] at a specific outdoor temperature *Tj*, calculated as the *design load* multiplied by the *part load ratio*;

(28) ‘*Bin-specific energy efficiency ratio*’ (*EERbin(Tj)*) means the energy efficiency ratio specific for every *bin* j with *outdoor temperature* Tj in a season, derived from the *part load*, *declared capacity* and *declared energy efficiency ratio (EERd(Tj))* for specified *bins (j)* and calculated for other *bins* through inter/extrapolation, when necessary corrected by the *degradation coefficient*;

(29) ‘*Seasonal coefficient of performance*’ (*SCOP*) is the overall coefficient of performance of the unit, representative for the whole designated heating season (the value of SCOP pertains to a designated heating season), calculated as the *Reference annual heating demand* divided by the *Annual electricity consumption for heating*;

(30) '*Reference annual heating demand*' (Q_H) means the reference heating demand [kWh/a], pertaining to a designated *heating season*, to be used as basis for calculation of SCOP and calculated as the product of the *design load for heating (Pdesignh)* and the seasonal *equivalent active mode hours for heating* (H_{HE})*;*

(31) '*Equivalent active mode hours for heating*' (H_{HE}) means the assumed annual number of hours [hrs/a] the unit must provide the *design load for heating* (Pdesignh) in order to satisfy the *Reference annual heating demand*, as described in table 8;

(32) '*Annual electricity consumption for heating*' (Q_{HE}) means the electricity consumption [kWh/a] required to meet the indicated *Reference annual heating demand* and which pertains to a designated heating season; and is calculated as the *Reference annual heating demand* divided by the *active mode coefficient of performance* (SCOPon) and the electricity consumption of the unit for *thermostat off-, standby-, off- and crankcase heater-mode* during the heating season;

(33) '*Active mode coefficient of performance*' (*SCOPon*) means the average coefficient of performance of the unit 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* (COPbin(Tj) and weighted by the bin hours the bin condition occurs;

(34) '*Electric back-up heater capacity*' (*elbu(Tj)*) is the heating capacity [kW] of a real or assumed electric back-up heater with COP of 1 that supplements the *declared capacity for heating (Pdh(Tj))* in order to meet the *part load* for heating *(Ph(Tj))* in case *Pdh(Tj)* is less than *Ph(Tj)*, for the *outdoor temperature (Tj)*;

(35) '*Bin-specific coefficient of performance*' (*COPbin(Tj)*) means the coefficient of performance specific for every *bin* j with *outdoor temperature* Tj in a season, derived from the *part load*, *declared capacity* and *declared coefficient of performance* (COPd(Tj)) for specified *bins (j)* and calculated for other *bins* through inter/extrapolation, when necessary corrected by the *degradation coefficient*;

(36) ‘*Declared capacity*’ [kW] is the capacity of the vapour compression cycle of the unit for cooling (*Pdc(Tj)*) or heating (*Pdh(Tj)*), pertaining to an outdoor temperature *Tj* and indoor temperature *(Tin)*, as declared by the manufacturer;

(37) ‘*Service value*’ (*SV*) [(m^3/min)/W] means for comfort fans the ratio of the *maximum fan flow rate* [m^3/min] and the *fan power input* [W];

(38) ‘*Capacity control*’ means the ability of the unit to change its capacity by changing the volumetric flow rate. Units are to be indicated as ‘*fixed*’ if the unit can not change its volumetric flow rate, '*staged*' if the volumetric flow rate is changed or varied in series of not more than two steps, or '*variable*' if the volumetric flow rate is changed or varied in series of three or more steps;

(39) ‘*Function*’ means the indication of whether the unit is capable of indoor air cooling, indoor air heating or both;

(40) ‘*Design load*’ means the declared cooling load (*Pdesignc*) and/or declared heating load (*Pdesignh*) [kW] at the *reference design temperature*, whereby

a. for cooling mode, *Pdesignc* is equal to the *declared capacity* for cooling at *Tj* equal to *Tdesignc* ;

b. for heating mode, *Pdesignh* is equal to the *part load* at *Tj* equal to *Tdesignh*;

(41) ‘*Declared energy efficiency ratio*’ (*EERd(Tj)*) means the energy efficiency ratio at a limited number of specified *bins* (*j)* with *outdoor temperature* (*Tj)*, as declared by the manufacturer;

(42) ‘*Declared coefficient of performance*’ (*COPd(Tj)*) means the coefficient of performance at a limited number of specified *bins* (*j)* with *outdoor temperature* (*Tj)*, as declared by the manufacturer;

(43) ‘*Bivalent temperature*’ (*Tbiv*) means the *outdoor temperature (Tj)* [°C] declared by the manufacturer for heating at which the *declared capacity* equals the *part load* and below which the *declared capacity* must be supplemented with *electric back up heater capacity* in order to meet the *part load* for heating;

(44) ‘*Operation limit temperature*’ (*Tol*) means the *outdoor temperature* [°C] declared by the manufacturer for heating, below which air conditioner will not be able to deliver any heating capacity. Below this temperature, the *declared capacity* is equal to zero;

(45) '*Cycling interval capacity*' [kW] is the (time-weighted) average of the *declared capacity* over the cycling test interval for cooling (*Pcycc)* or heating (*Pcych*);

(46) '*Cycling interval efficiency for cooling*' (*EERcyc*) is the average energy efficiency ratio over the cycling test interval (compressor switching on and off), calculated as the integrated cooling capacity over the interval [kWh] divided by the integrated electric power input over that same interval [kWh];

(47) '*Cycling interval efficiency for heating*' (*COPcyc*) is the average coefficient of performance over the cycling test interval (compressor switching on and off), calculated as the integrated heating capacity over the interval [kWh] divided by the integrated electric power input over that same interval [kWh];

(48) '*Degradation coefficient*' is the measure of efficiency loss due to cycling (compressor switching on/off in *active mode*) established for cooling (*Cdc*), heating (*Cdh*) or chosen as default value 0.25;

(49) '*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;

(50) '*Thermostat-off mode*' means a mode corresponding to the hours with no cooling or heating load whereby the cooling or heating function of the unit is switched on but the unit is not operational as there is no cooling or heating load. This condition is therefore related to outdoor temperatures and not to indoor loads. Cycling on / off in active mode is not considered as thermostat off;

(51) '*Crankcase heater operation*' means a condition where the unit has activated a heating device to avoid the refrigerant migrating to the compressor in order to limit the refrigerant concentration in oil at compressor start;

(52) '*Thermostat-off mode power consumption*' (P_{TO}) means the power consumption of the unit [kW] while in *thermostat-off* mode;

(53) '*Standby mode power consumption*' (P_{SB}) means the power consumption of the unit [kW] while in *standby* mode;

(54) '*Off-mode power consumption*' (P_{OFF}) means the power consumption of the unit [kW] while in *off*-mode;

(55) ‘*Crankcase heater mode power consumption*’ (P_{CK}) means the power consumption of the unit [kW] while in *crankcase heater operation* mode;

(56) ‘*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;

(57) ‘*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;

(58) ‘*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;

(59) ‘*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;

(60) ‘*Nominal air flow rate*’ means the air flow rate [m^3/h] measured at the air outlet of indoor and/or outdoor units (if applicable) of air conditioners at *standard rating conditions* for cooling (or heating, if the product has no cooling function);

(61) ‘*Rated power input for cooling*’ (P_{EER}) means the electric power input [kW] of a unit when providing cooling at *standard rating conditions*;

(62) ‘*Rated power input for heating*’ (P_{COP}) means the electric power input [kW] of a unit when providing heating at *standard rating conditions*;

(63) ‘*Electricity consumption of single / double ducts*’ (Q_{SD} respectively Q_{DD}) means the electricity consumption of single or double duct air conditioners for the cooling and/or heating mode (whichever applies) [single duct in kWh/h, double duct in kWh/a];

(64) ‘*Tolerance*’ means the deviation allowed for the declared capacity at outdoor temperature *Tj* to vary from the part load identified for the same outdoor temperature *Tj* as applied in the calculation of staged and variable capacity units;

2 TABLES

Table 1: Information sheet for air conditioners, except double ducts and single ducts

Information to identify the model(s) to which the information relates to

Function (indicate which function applies to the information)		If function applies to heating: Indicate the heating season the information relates to. Information should relate to one heating season at a time. Include at least the heating season 'Average'.	
cooling	Y/N	Average (mandatory)	Y/N
heating	Y/N	Warmer (if designated)	Y/N
		Colder (if designated)	Y/N

Item	**symbol**	**value**	**unit**	**Item**	**symbol**	**value**	**unit**
Design load				Seasonal efficiency			
cooling	Pdesignc	x,x	kW	cooling	SEER	x,x	-
heating / Average	Pdesignh	x,x	kW	heating / Average	SCOP (A)	x,x	-
heating / Warmer	Pdesignh	x,x	kW	heating / Warmer	SCOP (W)	x,x	-
heating / Colder	Pdesignh	x,x	kW	heating / Colder	SCOP (C)	x,x	-
Declared capacity* for cooling, at indoor temperature 27(19)ºC and outdoor temperature Tj				Declared Energy efficiency ratio* for cooling, at indoor temperature 27(19)ºC and outdoor temperature Tj			
Tj=35ºC	Pdc	x,x	kW	Tj=35ºC	EERd	x,x	-
Tj=30ºC	Pdc	x,x	kW	Tj=30ºC	EERd	x,x	-
Tj=25ºC	Pdc	x,x	kW	Tj=25ºC	EERd	x,x	-
Tj=20ºC	Pdc	x,x	kW	Tj=20ºC	EERd	x,x	-
Declared capacity* for heating / Average climate, at indoor temperature 20ºC and outdoor temperature Tj				Declared Coefficient of performance* for heating / Average climate, at indoor temperature 20ºC and outdoor temperature Tj			
Tj=-7ºC	Pdh	x,x	kW	Tj=-7ºC	COPd	x,x	-
Tj=2ºC	Pdh	x,x	kW	Tj=2ºC	COPd	x,x	-
Tj=7ºC	Pdh	x,x	kW	Tj=7ºC	COPd	x,x	-
Tj=12ºC	Pdh	x,x	kW	Tj=12ºC	COPd	x,x	-
Tj=bivalent temperature	Pdh	x,x	kW	Tj=bivalent temperature	COPd	x,x	-
Tj=operating limit	Pdh	x,x	kW	Tj=operating limit	COPd	x,x	-
Declared capacity* for heating / Warmer climate, at indoor temperature 20ºC and outdoor temperature Tj				Declared Coefficient of performance* / Warmer climate, at indoor temperature 20ºC and outdoor temperature Tj			
Tj=2ºC	Pdh	x,x	kW	Tj=2ºC	COPd	x,x	-
Tj=7ºC	Pdh	x,x	kW	Tj=7ºC	COPd	x,x	-
Tj=12ºC	Pdh	x,x	kW	Tj=12ºC	COPd	x,x	-
Tj=bivalent temperature	Pdh	x,x	kW	Tj=bivalent temperature	COPd	x,x	-
Tj=operating limit	Pdh	x,x	kW	Tj=operating limit	COPd	x,x	-
Declared capacity* for heating / Colder climate, at indoor temperature 20ºC and outdoor temperature Tj				Declared Coefficient of performance* / Colder climate, at indoor temperature 20ºC and outdoor temperature Tj			
Tj=-7ºC	Pdh	x,x	kW	Tj=-7ºC	COPd	x,x	-
Tj=2ºC	Pdh	x,x	kW	Tj=2ºC	COPd	x,x	-

Tj=7ºC	Pdh	x,x	kW	Tj=7ºC	COPd	x,x	-
Tj=12ºC	Pdh	x,x	kW	Tj=12ºC	COPd	x,x	-
Tj=bivalent temperature	Pdh	x,x	kW	Tj=bivalent temperature	COPd	x,x	-
Tj=operating limit	Pdh	x,x	kW	Tj=operating limit	COPd	x,x	-
Tj=-15ºC	Pdh	x,x	kW	Tj=-15ºC	COPd	x,x	-
Bivalent temperature				Operating limit temperature			
heating / Average	Tbiv	x	ºC	heating / Average	Tol	x	ºC
heating / Warmer	Tbiv	x	ºC	heating / Warmer	Tol	x	ºC
heating / Colder	Tbiv	x	ºC	heating / Colder	Tol	x	ºC
Power consumption of cycling				Efficiency of cycling			
cooling	Pcycc	x,x	kW	cooling	EERcyc	x,x	-
heating	Pcych	x,x	kW	heating	COPcyc	x,x	-
Degradation co-efficient cooling**	Cdc	x,x	-	Degradation co-efficient heating**	Cdh	x,x	-
Electric power input in power modes other than 'on mode'				Seasonal electricity consumption			
off mode	Poff	x,x	kW	cooling	Q_{CE}	x	kWh/a
standby mode	Psb	x,x	kW	heating / Average	Q_{HE}/A	x	kWh/a
thermostat-off mode	Pto	x,x	kW	heating / Warmer	Q_{HE}/B	x	kWh/a
crankcase heater mode	Pck	x,x	kW	heating / Colder	Q_{HE}/C	x	kWh/a
Capacity control (indicate one of three options)				Other items			
Fixed	Y/N			Sound power level (indoor/outdoor)	L_{WA}	x,x / x,x	dB(A)
staged	Y/N			Global warming potential	GWP	x	kgCO2 eq.
variable	Y/N			Rated air flow (indoor/outdoor)	-	x / x	m3/h
Contact details for obtaining more information	At minimum, name, position, postal address, e-mail address and telephone number.						
*= For staged capacity units, two values divided by a slash ('/') will be declared in each box in the section "Declared capacity of the unit" and "declared EER/COP" of the unit. The number of digits in the box indicates the precision of reporting.							
**= If default Cd=0,25 is chosen then (results from) cycling tests are not required. Otherwise either the heating or cooling cycling test value is required.							

Table 2: Information sheet for single duct and double duct air conditioners			
Information to identify the model(s) to which the information relates to *[fill in as necessary]*			
Description	**Symbol**	**Value**	**Unit**
Rated output for cooling	P_{rated} for cooling	*[x,x]*	kW
Rated output for heating	P_{rated} for heating	*[x,x]*	kW
Rated power input for cooling	P_{EER}	*[x,x]*	kW
Rated power input for heating	P_{COP}	*[x,x]*	kW
Rated Energy efficiency ratio	*EERrated*	*[x,x]*	-
Rated Coefficient of performance	*COPrated*	*[x,x]*	-
Thermostat-off mode power	P_{TO}	*[x,x]*	W
Standby mode power	P_{SB}	*[x,x]*	W
Seasonal electricity consumption			
for double ducts: seasonal electricity consumption			kWh/a or
for single ducts: hourly electricity consumption	*Q*	*[x,x]*	kWh/day
Sound power level (indoor only)	L_{WA}	*[x]*	dB(A)
Contact details for obtaining more information	At minimum, name, position, postal address, e-mail address and, telephone number.		

Table 3: Parameter list for calculation seasonal efficiency SEER/SCOP				
Description	**Symbol**	**Value**	**Unit**	**Note**
Bin-parameters				
Bin-index	j	0		
Outdoor temperature in bin j	Tj	0	°C	
Cooling load in bin j	Pc(Tj)	0,000	kW	
Heating load in bin j	Ph(Tj)	0,000	kW	
Cooling capacity in bin j	Pdc(Tj)	0,000	kW	
Heating capacity in bin j	Pdh(Tj)	0,000	kW	
Heat output electric back up in bin j	elbu(Tj)	0,000	kW	
CONSTANTS				
Reference design outdoor temperature	*cooling: Tdesignc* *heating: Tdesignh*	0	°C	Values see table 5
Hours per season in equivalent on-mode	*cooling:* H_{CE} *heating:* H_{HE}	0	h	Values see table 8
Hours per season in thermostat-off	H_{TO}	0	h	Values see table 8
Hours per season crankcase heater on	H_{CK}	0	h	Values see table 8
Hours per season stand-by mode	H_{SB}	0	h	Values see table 8
Hours per season in off-mode	H_{OFF}	0	h	Values see table 8
Indoor temperature cooling (for tests)	*Tin*	0	°C	Values see table 6

Table 4: Standard rating conditions (temperatures in ºC dry bulb / wet bulb)			
Appliance	**Function**	**Indoor air temperature Tin**	**Outdoor air temperature Tj**
air conditioners, excluding single duct (including double ducts)	cooling	27 / 19	35 / 24
	heating	20 / max. 15	7 / 6
single duct	cooling heating	35 / 24 20 / 12	35 / 24 * 20 / 12 *
* In case of single ducts the condensor (evaporator) when cooling (heating) is not supplied with outdoor air, but indoor air.			

Table 5: Reference design conditions (temperatures in ºC dry bulb / wet bulb)				
Function / season	**Indoor air temperature Tin**	**Outdoor air temperature Tdesignc / Tdesignh**	**Bivalent temperature Tbiv**	**Operating limit temperature Tol**
cooling	27ºC / wb: 19ºC	**Tdesignc** = 35 / 24	n.a.	n.a.
heating / Average	20ºC	**Tdesignh** = -10 / -11	max. 2	max. -7
heating / Warmer	/ wb: max. 15ºC	**Tdesignh** = 2 / 1	max. 7	max. 2
heating / Colder		**Tdesignh** = -22 / -23	Max. -7	max. -15

Table 6: Part load test conditions		
Cooling	**indoor air temperature**	**outdoor air temperature**

A	27ºC / wb: 19ºC	35ºC
B		30ºC
C		25ºC
D		20ºC

Heating	**Indoor air temperature (Tin)**	**Outdoor air temperature (Tj), for season**		
		Average	**Warmer**	**Colder**
A	20ºC / wb: max. 15ºC	-7ºC	n.a.	-7ºC
B		+2ºC	+2ºC	+2ºC
C		+7ºC	+7ºC	+7ºC
D		+12ºC	+12ºC	+12ºC
G		n.a.	n.a.	-15ºC

Table 7: Cooling and heating season bins (j = bin index, Tj = outdoor temp., hj = hours per annum per bin)

COOLING SEASON

j #	**Tj** °C	**hj** hrs
1	17	205
2	18	227
3	19	225
4	20	225
5	21	216
6	22	215
7	23	218
8	24	197
9	25	178
10	26	158
11	27	137
12	28	109
13	29	88
14	30	63
15	31	39
16	32	31
17	33	24
18	34	17
19	35	13
20	36	9
21	37	4
22	38	3
23	39	1
24	40	0
	total hrs.:	2602

HEATING SEASON

j #	**T_i** °C	**hj** hrs "Warmer"	"Average"	"Colder"
1 to 8	-30 to -23	0	0	0
9	-22	0	0	1
10	-21	0	0	6
11	-20	0	0	13
12	-19	0	0	17
13	-18	0	0	19
14	-17	0	0	26
15	-16	0	0	39
16	-15	0	0	41
17	-14	0	0	35
18	-13	0	0	52
19	-12	0	0	37
20	-11	0	0	41
21	-10	0	1	43
22	-9	0	25	54
23	-8	0	23	90
24	-7	0	24	125
25	-6	0	27	169
26	-5	0	68	195
27	-4	0	91	278
28	-3	0	89	306
29	-2	0	165	454
30	-1	0	173	385
31	0	0	240	490
32	1	0	280	533
33	2	3	320	380
34	3	22	357	228
35	4	63	356	261
36	5	63	303	279
37	6	175	330	229
38	7	162	326	269
39	8	259	348	233
40	9	360	335	230
41	10	428	315	243
42	11	430	215	191
43	12	503	169	146
44	13	444	151	150
45	14	384	105	97
46	15	294	74	61
	total hrs.:	3590	4910	6446

Table 8: Operational hours per type of air conditioner per functional mode (hrs/a)

Type of air conditioner / function		Unit	Heating season	On mode cooling: H_{CE} heating: H_{HE}	Thermostat-off mode H_{TO}	Standby mode H_{SB}	Off mode H_{OFF}	Crankcase heater mode H_{CK}
Air conditioners, except double ducts and single duct								
Cooling mode, if appliance offers cooling only		hrs/a		350	221	2142	5088	7760
Cooling and heating modes, if appliance offers both modes	Cooling mode	hrs/a		350	221	2142	0	2672
	Heating mode	hrs/a	Average	1400	179	0	0	179
			Warmer	1400	755	0	0	755
			Colder	2100	131	0	0	131
Heating mode, if appliance offers heating only		hrs/a	Average	1400	179	0	3672	3851
			Warmer	1400	755	0	2189	2944
			Colder	2100	131	0	4345	4476
Double duct								
Cooling mode, if appliance offers cooling only		hrs/a		350	221	2142	5088	7760
Cooling and heating modes, if appliance offers both modes	Cooling mode	hrs/a		350	221	2142	0	2672
	Heating mode	hrs/a		1400	179	0	0	179
Heating mode, if appliance offers heating only		hrs/a		1400	179	0	3672	3851
Single duct								
Cooling mode		hrs/h		1	0	0	0	0
Heating mode		hrs/h		1	0	0	0	0

3 AIR CONDITIONERS, EXCEPT SINGLE DUCTS AND DOUBLE DUCTS

This section describes for cooling and heating the method for calculating the seasonal energy performance and annual electricity consumption of air conditioners, except single and double duct air conditioners.

3.1 SEER

The SEER is the *seasonal energy efficiency ratio* for cooling and is calculated as:

$$SEER = Q_C / Q_{CE}$$ **Equation 1**

where:

Q_C is the reference annual cooling demand [kWh/a], calculated as:

$$Q_C = Pdesignc * H_{CE}$$ **Equation 2**

where:

Pdesignc is the design load for cooling [kW], equal to the declared capacity for cooling *Pdc(Tj)* at *Tj* = *Tdesignc* outdoor temperature;

H_{CE} = the equivalent active mode hours for cooling [hrs], as provided in Table 8

Q_{CE} is the annual electricity consumption for cooling [kWh/a], calculated as:

$$Q_{CE} = (Q_C / SEER_{on}) + H_{TO} \cdot P_{TO} + H_{CK} \cdot P_{CK} + H_{OFF} \cdot P_{OFF} + H_{SB} \cdot P_{SB}$$ **Equation 3**

$$SEER_{on} = \frac{\sum_{j=1}^{n} hj * Pc(Tj)}{\sum_{j=1}^{n} hj * \frac{Pc(Tj)}{EERbin(Tj)}}$$ **Equation 4**

where:

Tj is the bin temperature assigned to bin with index *j*, from Table 7;

j is the bin number;

n is the amount of bins;

hj is the number of hours assigned to bin with index *j*, from Table 7;

Pc(Tj) is the part load for cooling at bin *j*, calculated as:

$$Pc(Tj) = Pdesignc * pl(Tj)$$ **Equation 5**

where:

Pdesignc is defined before;

pl(Tj) is the part load ratio, calculated as (and concluding: pl(Tj) = 1.00 at Tj=Tdesignc):

***pl(Tj)* = (*Tj*-16) / (*Tdesignc* -16)** **Equation 6**

Tdesignc is the cooling season reference design temperature in ºC, from table 5;
EERbin(Tj) is the bin-specific energy efficiency ratio that applies to bin *j*, calculated according the equations below for either fixed, staged or variable capacity units, where:

3.1.1 for fixed capacity units

Calculate the anchor points *EERbin(Tj)* for the bin temperatures specified below to be used in inter- and extrapolations for *EERbin(Tj)* values at other bins.

Calculate for *Tj=35ºC*:

EERbin(Tj) = EERd(Tj) **Equation 7**

for *Tj=30, 25, 20ºC*:

EERbin(Tj) = EERd(Tj)*[1 - Cdc*(1 - Pc(Tj)/Pdc(Tj))] **Equation 8**

where:
EERd(Tj) is the declared energy efficiency ratio at the specified outdoor temperature Tj, as declared by the manufacturer in Table 1;
Pc(Tj) is the *part load* at bin *Tj= 30, 25, 20ºC*, as defined in equation **5** .
Pdc(Tj) is the declared cooling capacity at the specified outdoor temperature Tj, as declared by the manufacturer in Table 1;
Cdc is the *degradation factor for cooling*, which is either the default value 0,25, or equal to *Cdh* (for heating) or determined by tests and calculated for *Tj = 20ºC* as:

***Cdc*= (1 - *EERcyc*/*EERd(Tj)*)/(1 - *Pcycc*/*Pdc(Tj)*)** **Equation 9**

where:
EERcyc is the average energy efficiency ratio over the cycling test interval (on + off mode) calculated as the integrated cooling capacity over the interval [kWh] divided by the integrated electric power input over that same interval [kWh];
Pcycc is the (time-weighted) average cooling capacity output [kW] over the cycling test interval (on + off mode);

Values for *EERbin(Tj)* at other bins shall be calcutaled as follows:

- for bins *j* at outdoor temperatures between Tj < 35ºC and Tj > 20ºC and not corresponding to Tj = 30ºC or 25ºC, *EERbin(Tj)* shall be calculated using linear interpolation from the closest two anchor points.
- for bins *j* with an outdoor temperature *Tj* higher than 35°C *EERbin(Tj)* values shall have the same values as *EERbin*(Tj=35ºC) .
- for bins *j* with an outdoor temperature *Tj* lower than 20°C *EERbin(Tj)* values shall have the same value as *EERbin*(Tj=20ºC).

3.1.2 for staged capacity units

Calculate the anchor points *EERbin(Tj)* for the bin temperatures specified below to be used in inter- and extrapolations for *EERbin(Tj)* values at other bins.

The manufacturer shall declare for each test condition the cooling capacity (*Pdc(Tj)*) and efficiency (*EERd(Tj)*) of the equipment at both settings, to be indicated with "$_{hi}$" for the setting resulting in the highest capacity and "$_{lo}$" for the setting that results in the lower capacity. The *EERbin(Tj)* anchor-points are calculated from Pdc_{hi}, Pdc_{lo} and $EERd_{hi}$, $EERd_{lo}$ values for capacity and efficiency as follows:

For Tj =35ºC:

$EERbin(Tj) = EERd(Tj)_{hi}$ **Equation 10**

for *Tj=30, 25, 20ºC*:

if $Pdesignc*(pl(Tj)-tolerance) \leq Pdc(Tj)_{lo} \leq Pdesignc*(pl(Tj)+tolerance)$, then:

$EERbin(Tj) = EERd(Tj)_{lo}$ **Equation 11**

where:

$tolerance = -0.07 * pl(Tj) + 0.12$ **Equation 12**

if $Pdesignc*(pl(Tj)-tolerance) \leq Pdc(Tj)_{hi} \leq Pdesignc*(pl(Tj)+tolerance)$, then:

$EERbin(Tj) = EERd(Tj)^{hi}$ **Equation 13**

where *tolerance* is as defined before.

if $Pc(Tj) > Pdc(Tj)_{lo}$ then:

$$EERbin(Tj) = EERd(Tj)lo - \{(EERd(Tj)lo - EERd(Tj)hi) * \frac{(Pc(Tj) - Pdc(Tj)lo)}{(Pdc(Tj)hi - Pdc(Tj)lo)}\}$$

Equation 14

else:

$$\boldsymbol{EERbin(Tj) = EERd_{lo} \cdot [1 - Cdc \cdot (1 - Pc(Tj) / Pdc(Tj)_{lo})]}$$ **Equation 15**

where:

pl(Tj) is as defined before.

$EERd(Tj)_{hi}$ and $EERd(Tj)_{lo}$ are declared efficiency values from Table 1;

$Pdc(Tj)_{hi}$ and $Pdc(Tj)_{lo}$ are declared capacity values from Table 1;

Pc(Tj) is the part load for bin *j* with *Tj* is 20, 25, 30 and 35°C;

Cdc is the *degradation factor for cooling*, which is either the default value 0,25 or equal to *Cdc* (for cooling) or determined by tests and calculated for *Tj = 35ºC* as:

$$\boldsymbol{Cdc = (1 - EERcyc/EERd(Tj)_{lo}/(1 - Pcycc/Pdc(Tj)_{lo})}$$ **Equation 16**

where:

EERcyc and *Pcycc* are as defined before;

EERbin(Tj) values for bins *j* with outdoor temperatures *Tj* other than *Tj* = 35, 30, 25 and 20ºC are calculated according to the same rules applicable to **fixed capacity** units.

3.1.3 for variable capacity units

Calculate the anchor points *EERbin(Tj)* for the bin temperatures specified below to be used in inter- and extrapolations for *EERbin(Tj)* values at other bins.

If the capacity control of the unit allows it to operate with a capacity ***Pdc(Tj)*** corresponding to the required part load ***Pdesignc * (pl(Tj) ± 0.03)***, the *EERbin(Tj)* for bin *j* shall be assumed to be equal to *EERd(Tj)*.

Calculate for *Tj* = 35, 30, 25 and 20ºC:

if $Pdesign*(pl(Tj)-tolerance) \leq Pdc(Tj) \leq Pdesign*(pl(Tj)+tolerance)$ then:

$$\boldsymbol{EERbin(Tj) = EERd(Tj)}$$ **Equation 17**

where:
tolerance, Pdc(Tj), *Pdesignc*, *pl(Tj)*, *EERbin(Tj)* and *EERd(Tj)* are as defined before

else: follow the calculation procedure for **staged capacity** units.

3.2 SCOP

The SCOP is the *seasonal coefficient of performance for heating*. The calculation of the SCOP shall be specific for a designated heating season (average/warmer/colder), since the bins that apply, the reference design temperature and the design load are specific for a heating season. The calculations below show the generic approach which will have to be repeated for each designated heating season.

The *Seasonal coefficient of performance* for heating is calculated as:

$$SCOP = Q_H / Q_{HE} \qquad \textbf{Equation 18}$$

where:
Q_H is the reference annual heating demand [kWh/a], calculated as;

$$Q_H = Pdesignh * H_{HE} \qquad \textbf{Equation 19}$$

where:
Pdesignh is the design load for heating [kW] which is calculated from the declared bivalent point *Tbiv* (provides *pl(Tj)* for *Tj=Tbiv)*)and the declared capacity *Pdh(Tj)* at *Tj=Tbiv*. As such *Pdesignh,* as declared in Table 1, represents the heat load at *Tj=Tdesignh* operation condition, where *pl(Tj) = 1.00*;
H_{HE} is the equivalent active mode hours for heating [hrs], as provided in Table 8

Q_{HE} is the seasonal electricity consumption for heating [kWh/a], calculated as:

$$Q_{HE} = (Q_H / SCOP_{on}) + H_{TO} \cdot P_{TO} + H_{CK} \cdot P_{CK} + H_{OFF} \cdot P_{OFF} + H_{SB} \cdot P_{SB} \qquad \textbf{Equation 20}$$

where:
Q_H is as above;
H_{TO}, H_{CK} , H_{OFF} , H_{SB} are the number of seasonal operating hours (hrs/a) for heating in respectively thermostat−off, crankcase heater operation, off−mode and stand−by mode, given in Table 8;

P_{TO}*, *P_{CK}* , *P_{OFF}* , *P_{SB} is the electric power input [kW] in respectively thermostat−off, crankcase heater operation, off− and stand−by mode;

SCOPon is the average seasonal coefficient of performance , constructed from bin-specific coefficients of performance, and weighted by the seasonal hours the bin condition occurs, and including back up consumption for bins where *Pdh(Tj) < Ph(Tj)*:

$$SCOP_{on} = \frac{\sum_{j=1}^{n} hj * Ph(Tj)}{\sum_{j=1}^{n} hj * \frac{Ph(Tj) - elbu(Tj)}{COPbin(Tj)} + elbu(Tj)} \qquad \textbf{Equation 21}$$

where:

Tj, j, n, and *hj* are as defined before;

Ph(Tj) is the heating load at bin **j**, calculated as:

Ph(Tj) = Pdesignh*pl(Tj) **Equation 22**

where:

***pl(Tj)* = (*Tj*-16) / (*Tdesignh* -16)** **Equation 23**

Tdesignh is the heating season reference design temperature in °C, from Table 5, which is determined by the designated *heating season*;

elbu(Tj) is the capacity of a back up heater [kW] for bin *j*, needed to meet the heating part load if the declared capacity does not suffice, calculated as:

if **Pdh(Tj) < Ph(Tj):** ***elbu(Tj) = Ph(Tj) - Pdh(Tj)*** **Equation 24**

if **Pdh(Tj) ≥ Ph(Tj):** ***elbu(Tj) = 0*** **Equation 25**

Pdh(Tj) is the declared heating capacity applicable to bin *j*, to be calculated using the declared values of *Pdh(Tj)* at testing points *Tj* = -15, -7, 2, 7 and/or 12ºC, the availability of which depends on which heating season is designated (see table 6 for required declaration points per heating season). *Pdh(Tj)* for other bins than specified shall be calculated through linear interpolation of declared capacities Pdh(Tj) at the nearest outdoor temperatures.

Only in case of an average climate and the colder climate not being one of the designated climates (i.e. COP(-15) is not available) an exception to this rule can be made whereby the *COPbin(Tj)* values for outdoor temperatures -8, -9 and -10°C can be linearly extrapolated from the *COPd(Tj)* of the anchor points at -7°C and 7°C;

If the designated *heating season* is 'colder', and the lowest Pdh is at -15ºC, the capacities for Pdh with Tj<-15ºC shall be based on extrapolations from values at Tj= -15ºC and -7ºC.

COPbin(Tj) is the bin-specific coefficient of performance that applies to bin *j*, calculated according the equations below for either fixed, staged or variable capacity, where:

3.2.1 for fixed capacity units

Calculate the anchor points *COPbin(Tj)* for the bin temperatures specified below to be used in inter- and extrapolations for *COPbin(Tj)* values at other bins.

Calculate for Tj = 12, 7, 2, -7, -15ºC ([5],[6]):

if *Pdh(Tj)* ≥ *Ph(Tj)* (in this condition the fixed capacity unit will cycle)

$$COPbin(Tj)) = COPd(Tj) * [1 - Cdh * (1 - Ph(Tj)/Pdh(Tj)]$$ **Equation 26**

else if *Pdh(Tj)* < *Ph*(Tj) (this corresponds to a situation where backup heating is required to meet the heating load):

$$COPbin(Tj) = COPd(Tj)$$ **Equation 27**

where:

COPd(Tj) is the *coefficient of performance* at the specified outdoor temperature *Tj*, as declared by the manufacturer in Table 1;

Pdh(Tj) is the *heating capacity* at the specified outdoor temperature Tj, as declared by the manufacturer in Table 1;

Ph(Tj) is the *part load* in kW at the specified outdoor temperature *Tj*, as defined in equation 5.

Cdh is the degradation factor for heating, either taken as default value 0,25 or equal to *Cdc* (for cooling) or determined by tests and calculated for *Tj = 12ºC* as:

[5] Tj = -7ºC is not required for heating season 'Warmer';

[6] Tj = -15ºC is not required for heating season 'Warmer' and 'Average';

***Cdc*= (1 - *COPcyc*/*COPd(Tj)*/(1 - *Pcych*/*Pdh(Tj)*)** **Equation 28**

where:

COPcyc is is the average coefficient of performance over the cycling test interval (on + off mode) calculated as the integrated heating capacity over the interval [kWh] divided by the integrated electric power input over that same interval [kWh];

Pcych is the (time-weighted) average heating capacity output [kW] over the cycling test interval (on + off mode);

Values for *COPbin(Tj)* at other bins shall be calcutaled as follows:

- for bins *j* with outdoor temperatures *Tj* between than 12, 7, 2, -7, and -15ºC (see footnote 5, 6) *COPbin(Tj)* is calculated from linear inter- and extrapolation from the nearest two known anchor points;
- Only in case of an average climate and the colder climate not being one of the designated climates (i.e. COP(-15) is not available) an exception to this rule can be made whereby *the COPbin(Tj) values for outdoor temperatures -8, -9 and -10°C can be linearly extrapolated from the COP of the anchor points at -7°C and 7°C*;
- for bins *j* with an outdoor temperature *Tj* higher than 12°C *COPbin(Tj)* is calculated through linear extrapolation with the outdoor temperature starting from anchor-points *COPbin(Tj) with* Tj=7 and Tj=12;
- for bins *j* with an outdoor temperature *Tj* lower than *Tol* , *COPbin(Tj)* is equal to '1' in order to avoid a division by zero, but effectively the value is irrelevant because [*Ph(Tj)-elbu(Tj)*] in the equation for *SCOPon* (eq. 20) is zero.

3.2.2 for staged capacity units

Calculate the anchor points *COPbin(Tj)* for the bin temperatures specified below to be used in inter- and extrapolations for *COPbin(Tj)* values at other bins.

The manufacturer shall declare for each required test condition (with outdoor temperatures *Tj* between than 12, 7, 2, -7, and -15ºC (see footnote 5, 6), depending on the designated heating season) the heating capacity (*Pdh(Tj)*) and coefficient of performance (*COPd(Tj)*) of the equipment at both possible settings, to be indicated with

"$_{hi}$ " for the setting resulting in the highest capacity and "$_{lo}$ " for the setting that results in the lower capacity. The *COPbin(Tj)* anchor-points are calculated from Pdh^{hi}, Pdh_{lo} and/or $COPd^{hi}$, $COPd_{lo}$ values for capacity and efficiency as follows:

Calculate for Tj = 12, 7, 2, -7, -15 ºC (see footnote 5, 6):

if $Pdesignh*(pl(Tj)-tolerance) \leq Pdh_{lo} \leq Pdesignh*(pl(Tj)+tolerance)$, then

$COPbin(Tj) = COPd_{lo}$ **Equation 29**

where *tolerance* is as defined before.

if $Pdesignh*(pl(Tj)-tolerance) \leq Pdh_{hi} \leq Pdesignh*(pl(Tj)+tolerance)$, then

$COPbin(Tj) = COPd_{hi}$ **Equation 30**

where *tolerance* is as defined before.

else if $Ph(Tj) > Pdh(Tj)_{lo}$ and $Ph(Tj) < Pdh(Tj)_{hi}$ then

$$COPbin(Tj) = COPd(Tj)lo - \{(COPd(Tj)lo - COPd(Tj)hi) * \frac{(Ph(Tj) - Pdh(Tj)lo)}{(Pdh(Tj)hi - Pdh(Tj)lo)}\}$$

Equation 31

else:

$COPbin(Tj) = COP(Tj)_{lo} \cdot [1 - Cdh_{lo} \cdot (1 - Ph(Tj) / Pdh(Tj)_{lo})]$

Equation 32

where:

pl(Tj) is as defined before

$COPd(Tj)_{hi}$ and $COPd(Tj)_{lo}$ are declared coefficient values in Table 1;

$Pdh(Tj)_{hi}$ and $Pdh(Tj)_{lo}$ are declared values in Table 1;

Ph(Tj) is the heat load for bin *j* with *Tj* is 7, 2, -7, -15ºC (see footnote 5, 6);

Cdh_{lo} is the *degradation factor for heating*, which is either the default value 0,25, or equal to *Cdh* (for cooling) or determined by tests and calculated for *Tj = 12ºC* as:

$Cdc = (1 - COPcyc/COPd(Tj)_{lo}/(1 - Pcych/Pdh(Tj)_{lo})$ **Equation 33**

where:

COPcyc and *Pcych* are as defined before;

COPbin(Tj) values for bins *j* with outdoor temperatures *Tj* other than *Tj* = 7, 2, -7, -15ºC (see footnote 5, 6) are calculated according to the same rules as apply to **fixed capacity** units.

3.2.3 for variable capacity units

Calculate the anchor points *COPbin(Tj)* for the bin temperatures specified below to be used in inter- and extrapolations for *COPbin(Tj)* values at other bins.

If the capacity control of the unit allows it to operate with a declared capacity ***Pdh(Tj)*** corresponding to the required part load ***Pdesignh*(pl(Tj) ± tolerance)*** the *COPbin(Tj)* for bin *j* shall be assumed to be equal to *COPd(Tj)*;

Calculate for Tj = 12, 7, 2, -7, -15ºC (see footnote 5, 6):

if *Pdesign*(pl(Tj)-tolerance)* $\leq$ *Pdc(Tj)* $\leq$ *Pdesign*(pl(Tj)+tolerance)* then:

COPbin(Tj) = COPd(Tj) **Equation 34**

where:

tolerance, Pdh(Tj), Pdesignh, pl(Tj), COPbin(Tj) and *COPd(Tj)* are as defined before;

else: follow the calculation procedure for **staged capacity** units.

4 SINGLE DUCTS AND DOUBLE DUCTS

4.1 EER

The energy efficiency ratio *EERd(Tj)* for single ducts and double ducts is declared for *Tin* and *Tj* at standard rating condition and calculated as:

$EERd(Tj) = Pdc(Tj) / P_{EER}$ **Equation 35**

Where:

Pdc(Tj) is the declared capacity for cooling in kW, at standard rating condition *Tj*= 35ºC as required in Table 2;

P_{EER} is the total electric power input to the appliance (as delivered) in kW, at standard rating condition (*Tj*= 35ºC) as required in Table 2.

4.2 COP

The coefficient of performance COPd for single ducts and double ducts shall be declared for *Tin* and *Tj* at standard rating condition and calculated as:

$$COPd(Tj) = Pdh(Tj) / P_{COP}$$ **Equation 36**

where:

Pdh(Tj) is the declared capacity for heating in kW (of the vapour compression cycle only), at *Tj* = standard rating conditions as described in Table 4;

P_{COP} is the total electric power input to the appliance (as delivered) in kW, at *Tj* = standard rating conditions as described in Table 4.

4.3 Seasonal electricity consumption

The annual electricity consumption Q_{DD} in kWh/a of double ducts is calculated for cooling or heating as:

for cooling $\mathbf{Q = H_{CE} \cdot P_{EER} + H_{TO} \cdot P_{TO} + H_{SB} \cdot P_{SB} + H_{OFF} \cdot P_{OFF} + H_{CK} \cdot P_{CK}}$ **Equation 37**

for heating $\mathbf{Q = H_{HE} \cdot P_{COP} + H_{TO} \cdot P_{TO} + H_{SB} \cdot P_{SB} + H_{OFF} \cdot P_{OFF} + H_{CK} \cdot P_{CK}}$ **Equation 38**

where:

H_{CE}, H_{TO}, H_{SB}, H_{OFF}, H_{CK} are the number of annual operating hours (h) for cooling respectively heating, in respectively *active mode*, *thermostat-off*, *stand-by mode*, *off-mode* and *crankcase heater operation*, as described in Table 8;

P_{EER}, P_{COP}, P_{TO}, P_{SB}, P_{OFF}, P_{CK} are the average electric power consumption values for respectively *rated power input for cooling* (P_{EER}) or *heating* (P_{COP}), *thermostat-off*, *stand-by mode*, *off-mode* and *crankcase heater operation*, as declared by the manufacturer;

The electricity consumption of single ducts Q_{SD} in kWh/h will be expressed for the *active mode* function only, using as *equivalent active mode* hours (H_{CE}, H_{HE}) a value of one.:

for cooling $\mathbf{Q = H_{CE} \cdot P_{EER}}$ **Equation 39**

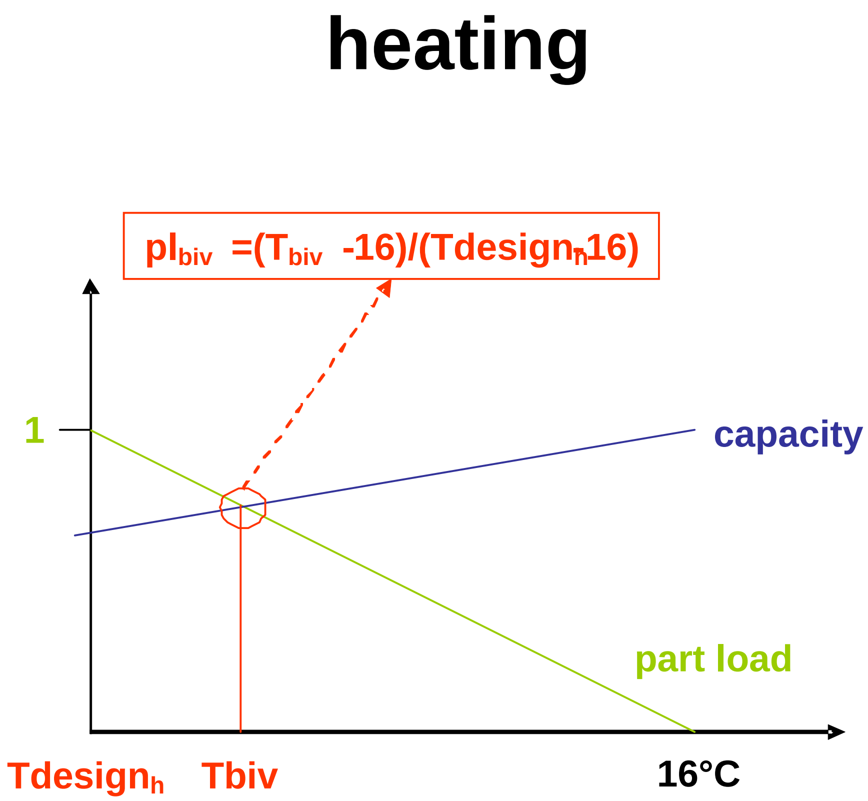
for heating $\mathbf{Q = H_{HE} \cdot P_{COP}}$ **Equation 40**

where:

P_{EER} and P_{COP} are as defined before;

ANNEX A

The graph below shows (for heating) the relationship of the *bivalent point* T_{biv} and the *part load*, including the *design load for heating* at $Tdesign_h$ (where part load equals 1). The area where *part load* exceeds the declared capacity is considered to be met by electric back up heating.



SECTION TWO - COMFORT FANS

1 DEFINITIONS

(1) ‘Comfort fan’ means an appliance designed for creating air movement around (part of) a human body for personal cooling comfort. This definition includes comfort fans that can perform additional functionalities such as lighting;

(2) ‘Fan power input’ (P_F) means the electric power input of a ‘comfort fan’ in Watt operating at the declared *maximum fan flow rate*, measured with the *oscillation mechanism* active (if applicable).

(3) 'Service value' (*SV*) [(m^3/min)/W] means for comfort fans the ratio of the *maximum fan flow rate* [m^3/min] and the *fan power input* [W];

(4) 'Maximum fan flow rate' (*F*) means the air flow rate of the comfort fan at its maximum setting [m^3/min], measured at the fan outlet with the *oscillating mechanism* (if applicable) turned off;

(5) 'Oscillating mechanism' means the capability of the comfort fan to automatically vary the direction of the air flow while the fan is operating;

(6) 'Fan electricity consumption' (*Q*) [kWh/a] means the annual electricity consumption of the comfort fan;

(7) 'Fan sound power level' means the A-weighted sound power level of the comfort fan while providing the *maximum fan flow rate*, measured at the outlet side;

(8) ‘Fan active mode hours’ (H_{CE}) means the number of hours [hrs/a] the comfort fan is assumed to provide the *maximum fan flow rate*, as described in Annex II, table 10;

2 TABLES

Table 9: Information sheet for comfort fans			
Information to identify the model(s) to which the information relates to *[fill in as necessary]*			
Description	**Symbol**	**Value**	**Unit**
Maximum fan flow rate	*F*	*[x,x]*	m^3/min
Fan power input	*P*	*[x,x]*	W
Service value	*SV*	*[x,x]*	(m^3/min)/W

Standby power	P_{SB}	*[x,x]*	W
Sound power level	L_{WA}	*[x]*	dB(A)
Measurement standard for service value	[state here the reference to measurement standard used]		
Contact details for obtaining more information	At minimum, name, position, postal address, e-mail address and, telephone number.		

Table 10: Operational hours Comfort fans				
	Unit	**Active mode**	**Standby mode**	**Off mode**
		H_{CE}	H_{SB}	H_{OFF}
Comfort fan	hrs/a	320	1120	0

3 SERVICE VALUE AND ANNUAL ELECTRICITY CONSUMPTION

3.1 Service value

The service value *SV* [m³/min/W] for comfort fans is calculated as:

$$SV = F/ P_F \qquad \textbf{Equation 41}$$

where:

F is the *maximum fan flow rate* [m³/min];

P_F is the *fan power input* [W];

3.2 Seasonal electricity consumption

The seasonal electricity consumption *Q* [kWh/a] of comfort fans is calculated as:

$$Q = H_{CE} \cdot P_F + H_{SB} \cdot P_{SB} \qquad \textbf{Equation 42}$$

where:

H_{CE}, H_{SB} are the number of operating hours in respectively *On mode* and *stand-by* mode, taken from Table 10 [hrs/a];

P_F is the nominal fan power input [kW];

P_{SB} is the power input in stand-by mode [kW].

For electric power in stand-by (P_{SB}) the same testing method applies as for air-conditioning appliances.

The electric fan power input is measured with the oscillating mechanism on. The flow rate is measured without the oscillations.

SECTION THREE - GENERAL ASPECTS

1 TEST REPORT

For the purpose of conformity assessment the manufacturer shall prepare and keep available upon request from market surveillance authorities test reports and all documentation needed to support the information declared by the manufacturer.
The test reports shall contain all relevant measurement information including but not limited to:

- relevant charts and sampled value tables of temperatures, relative humidity values, part loads, flow rates, electric voltage/ frequency/ harmonic distortion during the test period(s) and for all relevant test points;

- description of the test method(s) as applicable, laboratory space and ambient conditions, physical test rig set up specifying position of data capturing devices (e.g. sensors) and data processing equipment, as well as the operating range and measurement accuracy;

- settings of the unit being tested, description of the function of automatic switching of settings (e.g. between off mode and standby mode);

- description of the test sequence followed, e.g. to arrive at equilibrium conditions as applicable.

For variable capacity units, where EER, COP and capacities are declared, these shall be given **for the same frequency settings** for the same part load conditions.

The test report shall include the results of the part load test(s) and the calculation of EER or COP, reference SEER/SCOP and reference $SEER_{on}$/$SCOP_{on}$, where applicable.

In the test report, the calculated EER/COP values and reference SEER/SEERon/SCOP/ SCOPon values shall be based on the values declared by the manufacturer, on the condition that those values are within the acceptable tolerances.
Where this document does not describe measurement conditions, calculations or other aspects, manufacturers shall refer to measurements and calculations made using a reliable, accurate and reproducible method, which takes into account the generally

recognised state of the art methods, and whose results are deemed to be of low uncertainty, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union.
