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Luchtbehandelingsapparatuur, koeleenheden met vloeistof en warmtepompen met elektrisch aangedreven compressoren voor ruimteverwarming en -koeling - Deel 2: Beproevingsomstandigheden

Climatiseurs, groupes refroidisseurs de liquide et pompes à chaleur avec compresseur entraîné par moteur électrique pour le chauffage et la réfrigération des locaux - Partie 2: Conditions d'essai

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 2: Test conditions

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La présente norme européenne EN 14511-2:2008 a le statut d'une norme belge.

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English Version

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 2: Test conditions

Climatiseurs, groupes refroidisseurs de liquide et pompes à chaleur avec compresseur entraîné par moteur électrique pour le chauffage et la réfrigération des locaux - Partie 2: Conditions d'essai

Luftkonditionierer, Flüssigkeitskühlsätze und Wärmepumpen mit elektrisch angetriebenen Verdichtern für die Raumbeheizung und Kühlung - Teil 2: Prüfbedingungen

This European Standard was approved by CEN on 12 October 2007.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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Foreword

This document (EN 14511-2:2007) has been prepared by Technical Committee CEN/TC 113 "Heat pumps and air conditioning units", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2008, and conflicting national standards shall be withdrawn at the latest by May 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14511-2:2004.

EN 14511 comprises the following parts under the general title "*Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling*":

- *Part 1: Terms and definitions*
- *Part 2: Test conditions*
- *Part 3: Test methods*
- *Part 4: Requirements*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part of EN 14511 specifies the test conditions for the rating of air and water cooled air conditioners, liquid chilling packages, air-to-air, water-to-air, air-to-water and water-to-water heat pumps with electrically driven compressors when used for space heating and/or cooling. It also specifies test conditions for heat recovery operation of multisplit systems.

This European Standard applies to factory-made units that can be ducted.

This standard applies to factory-made liquid chilling packages with integral condensers or for use with remote condensers.

This standard applies to factory-made units of either fixed capacity or variable capacity by any means.

Packaged units, single split and multisplit systems are covered by this standard. Single duct and double duct units are covered by the standard.

In the case of units consisting of several parts, the standard applies only to those designed and supplied as a complete package, except for liquid chilling packages with remote condenser.

This standard is primarily intended for water and brine chilling packages but can be used for other liquid subject to agreement.

This standard applies to air-to-air air conditioners which evaporate the condensate on the condenser side.

The units having their condenser cooled by air and by the evaporation of external additional water are not covered by this standard.

This standard does not apply to units using transcritical cycles, e.g. with CO₂ as refrigerant.

Installations used for heating and/or cooling of industrial processes are not within the scope of this standard.

NOTE Part load testing of units is dealt with in CEN/TS 14825.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 14511-1:2007, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 1: Terms and definitions*

EN 14511-3:2007, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 3: Test methods*

EN 14511-4:2007, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 4: Requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14511-1:2007 apply.

4 Test conditions

4.1 Environmental conditions and electrical power supply requirements

The tests shall be carried out under the environmental conditions specified in Table 1 or Table 2 depending on the location of the unit.

For all units, electrical power voltage and frequency shall be given by the manufacturer.

Table 1 — Environmental conditions for units designed for installation indoors

Type	Measured quantities	Rating test
Water-to-water units	Dry bulb temperature	15 °C to 30 °C
Air-to-water units with duct connection on the air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Air-to-water units without duct connection on the air inlet side	Dry bulb temperature Wet bulb temperature	As inlet temperatures see Table 9 or Table 10
Water-to-air units with duct connection on the air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Water-to-air units without duct connection on the air inlet and outlet side	Dry bulb temperature Wet bulb temperature	As inlet temperatures see Table 5 or Table 6
Air-to-air units with duct connection on the indoor air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Air-to-air units without duct connection on the indoor air inlet and outlet side	Dry bulb temperature Wet bulb temperature	As inlet temperatures see Table 3 or Table 4

Table 2 — Environmental conditions for units designed for installation outdoors

Type	Measured quantities	Rating test
Air-to-water units	Dry bulb temperature Wet bulb temperature	As inlet temperatures see Table 9 and Table 10
Water-to-air units without duct connection on the air inlet side	Dry bulb temperature Wet bulb temperature	As inlet temperatures see Table 5 and Table 6
Air-to-air units with duct connection on the indoor air inlet and outlet side	Dry bulb temperature Wet bulb temperature	As inlet temperatures see Table 3 and Table 4

4.2 Rating conditions

For the rating tests, the appropriate test conditions shall be applied in accordance with:

- Table 3 for air-to-air units in heating mode;
- Table 4 for air-to-air units in cooling mode;
- Table 5 for water-to-air units in heating mode;

- Table 6 for water-to-air units in cooling mode;
- Table 7 for water-to-water units in heating mode;
- Table 8 for water-to-water units in cooling mode;
- Table 9 for air-to-water in heating mode;
- Table 10 for air-to-water in cooling mode;
- Table 11 for liquid chilling packages with remote condenser;
- Table 12 for liquid chilling packages for heat recovery condenser;
- Table 13 for basic, multiple circuit and modular air-cooled multisplit systems in the heating mode;
- Table 14 for basic, multiple circuit and modular air-cooled multisplit systems in the cooling mode;
- Table 15 for modular heat recovery air-cooled multisplit systems;
- Table 16 for basic, multiple circuit and modular water-cooled multisplit systems in the heating mode;
- Table 17 for basic, multiple circuit and modular water-cooled multisplit systems in the cooling mode.

For units with brine, the test shall be carried out with the brine specified by the manufacturer, see 7.2.1 of EN 14511-4:2007.

Table 3 — Air-to air heat pumps - Heating mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating Conditions	Outside air / recycled air (e.g. window, double duct, split units)	7	6	20	15 max
	Exhaust air / recycled air	20	12	20	12
	Exhaust air / outdoor air	20	12	7	6
Application rating conditions	Outside air / recycled air (e.g. window, double duct, split units)	2	1	20	15 max.
	Outside air / recycled air (e.g. window, double duct, split units)	- 7	- 8	20	15 max.
	Outside air / recycled air (e.g. window, double duct, split units)	- 15	-	20	15 max.
	Exhaust air / outdoor air	20	12	2	1
	Exhaust air / outdoor air	20	12	- 7	- 8

Table 4 — Air-to air heat pumps and air conditioners - Cooling mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating Conditions	Comfort (outside air / recycled air) (e.g. window, double duct, split units)	35	24 ^a	27	19
	Comfort (exhaust air / recycled air)	27	19	27	19
	Comfort (exhaust air / outdoor air)	27	19	35	24
	Single duct ^{b, c}	35	24	35	24
	Control cabinet	35	24	35	24
	Close control	35	24	24	17
Application rating conditions	Comfort (outside air / recycled air) (e.g. window, double duct, split units)	27	19 ^a	21	15
	Single duct ^{b, c}	27	19	27	19
	Comfort (outside air / recycled air) (e.g. window, double duct, split units)	46	24 ^a	29	19
	Control cabinet	50	30	35	24
	Close control	27	19	21	15

^a The wet bulb temperature condition is not required when testing units which do not evaporate condensate.
^b When using the calorimeter room method, pressure equilibrium between indoor and outdoor compartments shall be obtained by introducing into indoor compartment, air at the same rating temperature conditions.
^c The pressure difference between the two compartments of the calorimeter room shall not be greater than 1,25 Pa. This pressure equilibrium can be achieved by using an equalising device or by creating an open space area in the separation partition wall, which dimensions shall be calculated for the maximum airflow of the unit to be tested. If an open space is created in the partition wall, an air sampling device or several temperature sensors shall be used to measure the temperature of the air from the outdoor compartment to the indoor compartment

Table 5 — Water-to-air heat pumps - Heating mode

		Outdoor heat exchanger		Inlet heat exchanger	
		Inlet temperature °C	Outlet temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb Temperature °C
Standard rating conditions	Water	15	12/ ^a	20	15 max.
	Brine	0	-3/ ^a	20	15 max.
	Water loop	20	17/ ^a	20	15 max.
Application rating conditions	Water	10	^b	20	15 max.
	Brine	5	^b	20	15 max.
	Brine	- 5	^b	20	15 max.

^a For units designed for heating and cooling mode, the flow rate obtained during the test at standard rating conditions in cooling mode (see Table 6) is used.
^b The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions.

Table 6 — Water-to-air heat pumps and air conditioners - Cooling mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet temperature °C	Outlet temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating conditions	Comfort	30	35	27	19
	Control cabinet	15	20	35	24
	Close control	30	35	24	17
Application rating conditions	Comfort	15	^a	27	19
	Comfort	40	^a	27	19
	Close control	15	^a	21	15
	Close control	40	^a	24	17

^a The test is performed at the water flow rate obtained during the test at the corresponding standard rating conditions.

Table 7 — Water-to-water heat pumps - Heating mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet temperature °C	Outlet temperature °C	Inlet temperature °C	Outlet temperature °C
Standard rating conditions	Water	10	7 ^a	40	45
	Brine	0	-3 ^a	40	45
	Water (for floor heating or similar application)	10	7 ^a	30	35
	Brine (for floor heating or similar application)	0	-3 ^a	30	35
Application rating conditions	Water	15	^b	^b	45
	Brine	5	^b	^b	45
	Brine (for floor heating or similar application)	5	^b	^b	35
	Brine	-5	^b	^b	45
	Brine	0	^b	^b	55
	Water	10	^b	^b	55

^a For units designed for heating and cooling mode, the flow rate obtained during the test at standard rating conditions in cooling mode (see Table 8) is used.

^b The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions.

Table 8 — Water-to-water heat pumps and liquid chilling packages - Cooling mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet temperature °C	Outlet temperature °C	Inlet temperature °C	Outlet temperature °C
Standard rating conditions	Water to water and brine to water	30	35	12	7
	Water to brine	30	35	0	-5
	Water to water and brine to water (for floor cooling or similar application)	30	35	23	18
Application rating conditions	Water to water	15	^a	^a	7
	Water to brine	15	^a	^a	-5

^a The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions.

Table 9 — Air-to-water heat pumps - Heating mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet temperature °C	Outlet temperature °C
Standard rating conditions	Outdoor air	7	6	40	45
	Exhaust air	20	12	40	45
	Outdoor air (for floor heating or similar application)	7	6	30	35
Application rating conditions	Outdoor air (for floor heating or similar application)	2	1	a	35
	Outdoor air (for floor heating or similar application)	- 7	- 8	a	35
	Outdoor air (for floor heating or similar application)	- 15	-	a	35
	Outdoor air	2	1	a	45
	Outdoor air	- 7	- 8	a	45
	Outdoor air	- 15	-	a	45
	Outdoor air	7	6	a	55
	Outdoor air	-7	-8	a	55

^a The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions.

Table 10 — Air-to-water heat pumps and liquid chilling packages - Cooling mode

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet temperature °C	Outlet temperature °C
Standard rating conditions	water	35	-	12	7
	brine	35	-	0	- 5
	water (for floor cooling or similar application)	35	-	23	18
Application rating conditions	water	27	-	a	7
	water (for floor cooling or similar application)	27	-	a	18
	water	46	-	a	7
	brine	27	-	a	- 5

^a The test is performed at the water flow rate obtained during the test at the corresponding standard rating conditions.

Table 11 — Liquid chilling packages with remote condenser

		Indoor heat exchanger		Refrigerant side	
		Inlet temperature °C	Outlet temperature °C	Saturated vapour/ bubble point temperature ^a °C	Liquid temperature °C
Standard rating conditions	Water	12	7	45	40
	Brine	0	- 5	45	40
Application rating conditions	Water	^b	7	35	30
	Brine	^b	- 5	35	30

^a The bubble point is defined from the pressure measured at the discharge of the compressor.
^b The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions.

Table 12 — Liquid chilling packages with heat recovery condenser

Standard rating conditions	Condenser		Evaporator ^c		Heat recovery water heat exchanger	
	Air inlet dry bulb temperature ^a °C	Water inlet temperature ^b °C	Water outlet temperature °C	Brine outlet temperature °C	Inlet temperature °C	Outlet temperature °C
	35	30	7	-5	40	45

^a If the air cooled condenser is ducted then the test shall be conducted at the minimum flow rate specified by the manufacturer.
^b At the minimum flow rate specified by the manufacturer.
^c With the flow rate as determined during the test at the corresponding standard rating conditions (see Table 8 or Table 10).

Table 13 — Heating capacity conditions for air-cooled multisplit systems

	Outdoor heat exchanger		Indoor heat exchanger	
	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating conditions	7	6	20	15 max.
Application rating conditions	2	1	20	15 max.
	- 7	- 8	20	15 max.

Table 14 — Cooling capacity conditions for air-cooled multisplit systems

	Outdoor heat exchanger		Indoor heat exchanger	
	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating conditions	35	24 ^a	27	19
Application rating conditions	27	19 ^a	21	15
	46	24 ^a	29	19

^a The wet bulb condition is not required when testing units which do not evaporate condensate.

Table 15 — Heat recovery conditions for air-cooled multisplit systems

			Three room calorimeter or air enthalpy		Two room Air enthalpy	
			Dry bulb temperature °C	Wet bulb temperature °C	Dry bulb temperature °C	Wet bulb temperature °C
Application rating conditions	Outdoor side		7	6	7	6
	Indoor side	Heating	20	-	20	19
		Cooling	27	19	20	19

Table 16 — Heating capacity conditions for water-cooled multisplit systems

		Outdoor heat exchanger		Indoor heat exchanger	
		Inlet temperature °C	Outlet temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb Temperature °C
Standard rating conditions	Water	15	12/ ^a	20	15 max.
	Brine	0	-3/ ^a	20	15 max.
	Water loop	20	17/ ^a	20	15 max.
Application rating conditions	Water	10	^b	20	15 max.
	Brine	5	^b	20	15 max.
	Brine	- 5	^b	20	15 max.

^a For units designed for heating and cooling mode, the flow rate obtained during the test at standard rating conditions in cooling mode (see Table 17) is used.

^b The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions.

Table 17 — Cooling capacity conditions for water-cooled multisplit systems

	Outdoor heat exchanger		Indoor heat exchanger	
	Inlet temperature °C	Outlet temperature °C	Inlet dry bulb temperature °C	Inlet wet bulb temperature °C
Standard rating conditions	30	35	27	19
Application rating conditions	15	^a	27	19
	40	^a	27	19
^a The test is performed at the nominal water flow rate obtained during the test at the corresponding standard rating conditions.				

Annex A (normative)

Energy labelling application

A.1 General

The present standard shall be used to declare the energy efficiency class and to provide performance characteristics of air conditioners and heat pumps under the scope of the Energy Labelling Directive 2002/31/EC, for both the labelling and the technical documentation.

A.2 Rating conditions

A.2.1 General

The rating conditions for which the performance are declared are indicated in this standard and are specified hereafter for each type of product covered by the energy labelling.

The performance rating shall be established in accordance with the test procedure of EN 14511-3.

A.2.2 Air-cooled air conditioners (air-to-air conditioners)

Standard rating conditions “comfort” indicated in Table 4 shall be used to determine the cooling capacity, the EER, the annual energy consumption and the efficiency class of single split and packaged air-cooled air conditioners.

For reverse cycle units, the heating capacity and the efficiency class shall be determined from one of the standard rating conditions indicated in Table 3 depending of the heat source and heat sink.

Standard rating conditions indicated in Table 14 shall be used to determine the cooling capacity, the EER, the annual energy consumption and the efficiency class of air-cooled multisplit air conditioners.

For reverse cycle units, the heating capacity and the efficiency class shall be determined from the standard rating conditions indicated in Table 13.

A.2.3 Single-duct air conditioners

Standard rating conditions “single-duct” indicated in Table 4 shall be used to determine the cooling capacity, the EER, the annual energy consumption and the efficiency class of single-duct units.

A.2.4 Water-cooled air conditioners (water-to-air conditioners)

Standard rating conditions “comfort” indicated in Table 6 shall be used to determine the cooling capacity, the EER, the annual energy consumption and the efficiency class of split and packaged water-cooled air conditioners.

For reverse cycle units, the heating capacity and the efficiency class shall be determined from one of the standard rating conditions indicated in Table 5 depending of the heat source: water, brine or close loop.

Standard rating conditions indicated in Table 17 shall be used to determine the cooling capacity, the EER, the annual energy consumption and the efficiency class of water-cooled multisplit air conditioners.

For reverse cycle units, the heating capacity and the efficiency class shall be determined from the standard rating conditions indicated in Table 16.

A.2.5 Double duct air conditioners

Standard rating conditions "comfort" (outside air / recycled air) indicated in Table 4 shall be used to determine the cooling capacity, the EER, the annual energy consumption and the efficiency class of double duct air conditioners.

For reverse cycle units, the heating capacity and the efficiency class shall be determined from the standard rating conditions "Outside air / recycled air" indicated in Table 3.

A.2.6 Other appliances

Single-duct units operating in the heating mode to which Table 3.3 of Annex IV of Directive 2002/31/EC refers are not covered by EN 14511.

A.3 Test procedure

When the present standard is used for the energy labelling of air conditioners and heat pumps below 12 kW, the cooling / heating capacities, power input and EER/COP as well as the energy efficiency class of a product shall be determined by using exclusively the calorimeter room method.

For ducted units, the settings of the air flow rate and external static pressure shall be made prior to the cooling / heating capacity tests, according to EN 14511-3:2007, 4.4.1. Once determined, the static pressure shall be set, with dry coil, by adjusting to the air discharge area of the unit, a length of duct equipped with a damper which position shall not be changed during the capacity tests.

The length of duct and the distance of the damper from the discharge section of the unit shall conform to the requirements of EN 14511-3:2007, B.2.1.

A.4 Tolerances permitted on declared values

A.4.1 General

The following requirements apply to the declared values.

The requirements for the uncertainties of measurement of 4.3 of EN 14511-3:2007 shall be respected.

A.4.2 First testing

The performance published data shall be accepted as valid when a sample of a model, tested in accordance with the present standard, shall meet the following criteria for cooling and heating mode as applicable:

Tested cooling and heating capacity	$\geq 0,88 \text{ X declared capacity}$
Tested EER	$\geq 0,85 \text{ X declared EER}$
Tested COP	$\geq 0,85 \text{ X declared COP}$

A.4.3 Second testing

If the result of test on capacity and/or EER/COP carried out on the first appliance is not in compliance with the requirements given in A.4.2, a second test shall be carried out on one other appliance. This second test shall meet the following criteria for cooling and heating mode as applicable:

Tested cooling and heating capacity	$\geq 0,88 \text{ X declared capacity}$
Tested EER	$\geq 0,85 \text{ X declared EER}$
Tested COP	$\geq 0,85 \text{ X declared COP}$

Bibliography

- [1] CEN/TS 14825, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling – Testing and rating at part load conditions*
- [2] Commission Directive 2002/31/EC – Implementation of Council Directive 92/75/EEC with regard to energy labelling of household air-conditioners

