BS EN 15218:2013

BSI Standards Publication

Air conditioners and liquid chilling packages with evaporatively cooled condenser and with electrically driven compressors for space cooling — Terms, definitions, test conditions, test methods and requirements

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National foreword

This British Standard is the UK implementation of EN 15218:2013. It supersedes BS EN 15218:2006 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee RHE/17, Testing of air conditioning units.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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English Version

Air conditioners and liquid chilling packages with evaporatively cooled condenser and with electrically driven compressors for space cooling - Terms, definitions, test conditions, test methods and requirements

Climatiseurs et groupes refroidisseurs de liquide à condenseur refroidi par évaporation et compresseur entraîné par moteur électrique pour la réfrigération des locaux - Termes, définitions, conditions d'essai, méthodes d'essai et exigences

Luftkonditionierer und Flüssigkeitskühlsätze mit verdunstungsgekühltem Verflüssiger und elektrisch angetriebenen Verdichtern für die Raumkühlung - Begriffe, Prüfbedingungen, Prüfverfahren und Anforderungen

This European Standard was approved by CEN on 30 May 2013.

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Foreword

This document (EN 15218:2013) 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of an identical text or by endorsement, at the latest by January 2014 and conflicting national standards shall be withdrawn at the latest by January 2014.

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

This document supersedes EN 15218:2006.

The main changes with respect to the previous edition are listed below:

a) the addition of requirements related to the electrical consumption and the air flow rate measurement of ducted units;

b) the addition of a table template containing the test results of the ducted units;

c) the addition of an Annex Z related to the Commission Regulation (EC) n°206/2012.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Although this document has been be prepared in the frame of the commission regulation (EU) No 206/2012 implementing Directive 2009/125/EC with regard to ecodesign requirements for air conditioners and comfort fans, it is also intended to support the essential requirements of the European Directive 2010/30/CE.

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

1 Scope

This European Standard specifies the terms, definitions, test conditions, test methods and requirements for rating the performance of air conditioners and liquid chilling packages, with electrically driven compressors and with evaporatively cooled condenser when used for space cooling. The evaporatively cooled condenser is cooled by air and by the evaporation of external additional water. This additional external water is fed by a specific water supply circuit or by a water tank.

This European Standard does not apply to air-to-air and air-to-water air conditioners with a condenser cooled by air and by the evaporation of water condensed on their evaporator.

This European Standard applies to units equipped with a water tank or with a continuous water circuit supply that can also operate without water feeding. However the standard only concerns the testing of these units with water feeding.

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

This European 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 European Standard.

With regard to units consisting of several parts, this European Standard applies only to those designed and supplied as a complete package.

Evaporatively cooled condenser units that can also operate in heating mode shall have their performance in this mode determined according to EN 14511.

Installations used for industrial processes cooling are not within the scope of this European Standard.

This European Standard specifies the conditions for which performance data shall be declared for compliance to the Ecodesign regulation 206/2012 and to the Energy Labelling regulation 626/2011 of air conditioners with evaporatively cooled condenser in cooling mode.

NOTE All the symbols given in this text can be used regardless of language.

2 Normative references

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

EN 14511-1:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 1: Terms, definitions and classification*

EN 14511-2, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 2: Test conditions*

EN 14511-3:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 3: Test methods*

EN 14511-4:2013, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling — Part 4: Operating requirements, marking and instructions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14511-1:2013 and the following apply.

3.1
evaporatively cooled condenser
heat exchanger that condenses refrigerant vapour by rejecting heat to a water and air mixture causing the water to evaporate and increase the enthalpy of air

Note 1 to entry: Desuperheating and sub-cooling of the refrigerant may also occur.

3.2
water tank
tank designed as an integral part of the unit to contain external additional water which is fed to the evaporatively cooled condenser

3.3
continuous supply water circuit
circuit designed as an integral part of the unit to feed continuously the evaporatively cooled condenser with water from an external water source

3.4
effective power input
P_E
average electrical power input of the unit within a defined interval of time obtained from:

— power input for operating the compressor;

— power input for all control and safety devices of the unit;

— power input of the circulating pump which provides water to the evaporatively cooled condenser, if any;

— proportional power input of the conveying devices (e.g. fans, pumps) for ensuring the transport of the heat transfer media inside the unit, expressed in Watt.

Note 1 to entry: For the purposes of this standard the present definition replaces the one in EN 14511-1 and is used to calculate the EER and EER_{rated}.

3.5
cleaning cycle
interval of time during which water is sprayed on the evaporatively cooled condenser in order to remove fouling and scale buildup

3.6
functioning cycle
interval of time elapsed between the start of two successive cleaning cycles for evaporatively cooled condenser units with a continuous water supply

4 Classification

If the heat transfer medium for the indoor heat exchanger is water, the unit shall be denominated as evaporatively cooled condenser liquid chilling package.

If the heat transfer medium for the indoor heat exchanger is air, the unit shall be denominated as evaporatively cooled condenser air conditioner.

5 Test conditions

5.1 Environmental conditions and electrical power supply requirements

The tests shall be carried out under the environmental conditions specified in Table 1 or Table 2 based 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 indoor installation

Type	Measured quantities	Rating test
Evaporatively cooled condenser liquid chilling packages with duct connection on the air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Evaporatively cooled condenser liquid chilling packages without duct connection on the air inlet side	Dry bulb temperature Wet bulb temperature	As air inlet temperatures, see Table 5 or Table 6
Evaporatively cooled condenser air conditioners with duct connection on the indoor air inlet and outlet side	Dry bulb temperature	15 °C to 30 °C
Evaporatively cooled condenser air conditioners without duct connection on the indoor air inlet and outlet side	Dry bulb temperature Wet bulb temperature	As air inlet temperatures, see Table 3 or Table 4

Table 2 — Environmental conditions for units designed for outdoor installation

Type	Measured quantities	Rating test
Evaporatively cooled condenser liquid chilling packages	Dry bulb temperature Wet bulb temperature	As air inlet temperatures, see Table 5 and Table 6
Evaporatively cooled condenser air conditioners 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

5.2 Rating conditions

For the rating tests, the appropriate test conditions apply in accordance with Table 3 and Table 4 for evaporatively cooled condenser air conditioners or with Table 5 and Table 6 for evaporatively cooled condenser liquid chilling packages.

Table 3 –Evaporatively cooled condenser air conditioner with continuous water supply circuit

		Evaporatively cooled condenser			**Indoor heat exchanger**	
		Air		**Water**		
		Inlet dry bulb temperature ºC	**Inlet wet bulb temperature** ºC	**Inlet temperature** ºC	**Inlet dry bulb temperature** ºC	**Inlet wet bulb temperature** ºC
Standard rating conditions	Comfort (outdoor air / recycled air) – double duct	35	24	15	27	19
	Comfort (exhaust air / recycled air)	27	19	15	27	19
	Comfort (exhaust air / outdoor air)	27	19	15	35	24
	Single duct [a, b]	35	24	15	35	24
	Control cabinet	35	24	15	35	24
	Close control	35	24	15	24	17
Application rating conditions	Comfort (outdoor air / recycled air) – double duct	27	19	15	21	15
	Single duct	27	19	15	27	19
	Comfort (outdoor air / recycled air) – double duct	46	24	15	29	19
	Control cabinet	50	30	15	35	24
	Close control	27	19	15	21	15

[a] 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.

[b] 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

The external additional water supply on the evaporatively cooled condenser shall be set as specified in 6.2.2.

Table 4 –Evaporatively cooled condenser air conditioner with a water tank

		Evaporatively cooled condenser			Indoor heat exchanger	
		Air		Water		
		Inlet dry bulb temperature	Inlet wet bulb temperature	Inlet temperature	Inlet dry bulb temperature	Inlet wet bulb temperature
		ºC	ºC	ºC	ºC	ºC
Standard rating conditions	Comfort (outdoor air / recycled air) – double duct	35	24	35	27	19
	Comfort (exhaust air / recycled air)	27	19	27	27	19
	Comfort (exhaust air / outdoor air)	27	19	27	35	24
	Single duct [a, b]	35	24	35	35	24
	Control cabinet	35	24	35	35	24
	Close control	35	24	35	24	17
Application rating conditions	Comfort (outdoor air / recycled air) – double duct	27	19	27	21	15
	Single duct [a, b]	27	19	27	27	19
	Comfort (outdoor air / recycled air) – double duct	46	24	46	29	19
	Control cabinet	50	30	50	35	24
	Close control	27	19	27	21	15

[a] 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.

[b] 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 – Evaporatively cooled condenser liquid chilling package with a continuous water supply circuit

		Evaporatively cooled condenser			Indoor heat exchanger	
		Air		Water		
		Inlet dry bulb temperature	Inlet wet bulb temperature	Inlet temperature	Inlet temperature	Outlet temperature
		ºC	ºC	ºC	ºC	ºC
Standard rating conditions	Water	35	24	15	12	7
	Brine	35	24	15	0	–5
	Water (for floor cooling or similar application)	35	24	15	23	18
Application rating conditions	Water	27	19	15	[a]	7
	Water (for floor cooling or similar application)	27	19	15	[a]	18
	Water	46	24	15	[a]	7
	Brine	27	19	15	[a]	–5

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

The external additional water supply on the evaporatively cooled condenser shall be set as specified in 6.2.2.

Table 6 – Evaporatively cooled condenser liquid chilling package with a water tank

		Evaporatively cooled condenser			Indoor heat exchanger	
		Air		Water		
		Inlet dry bulb temperature	Inlet wet bulb temperature	Inlet temperature	Inlet temperature	Outlet temperature
		ºC	ºC	ºC	ºC	ºC
Standard rating conditions	Water	35	24	35	12	7
	Brine	35	24	35	0	–5
	Water (for floor cooling or similar application)	35	24	35	23	18
Application rating conditions	Water	27	19	27	[a]	7
	Water (for floor cooling or similar application)	27	19	27	[a]	18
	Water	46	24	46	[a]	7
	Brine	27	19	27	[a]	–5

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

6 Rating capacity test

6.1 Basic principles

The cooling capacity of evaporatively cooled condenser air conditioners having cooling capacity below or equal to 12 kW shall be determined by measurements in a calorimeter room.

The cooling capacity of evaporatively cooled condenser air conditioners having a cooling capacity greater than 12 kW shall be determined by measurements in a calorimeter room or by the air enthalpy method.

The calorimeter room and the air enthalpy method are described in Annex A and Annex B of EN 14511-3:2013 respectively.

The cooling capacity of evaporatively cooled condenser liquid chilling packages shall be determined in accordance with the direct method at the water or brine heat exchanger, as described in 4.1.2 of EN 14511-3:2013.

4.1.4, 4.1.5 and 4.1.6 of EN 14511-3:2013 apply according to the type of unit to be tested.

6.2 Test apparatus

6.2.1 Arrangement of the test apparatus

The test apparatus shall be designed in such a way that all requirements on adjustment of set values, stability criteria and uncertainties of measurement according to this European Standard and to EN 14511 (all parts) can be fulfilled.

4.2.1 of EN 14511-3:2013 applies.

6.2.2 Installation and connection of the test object

The test object shall be installed and connected for the test as recommended by the manufacturer in his or her installation and operation manual.

The accessories provided by option are not included for the test.

For evaporatively cooled condenser units with water tank the water tank shall be filled as recommended by the manufacturer.

Evaporatively cooled condenser units with a continuous water supply circuit shall be connected to the external water source as specified by the manufacturer. In particular, evaporatively cooled condenser units with a continuous supply water circuit which are not provided with a water collecting basin underneath the condenser, the external water source pressure shall be set as specified by the manufacturer or at 300 kPa, whichever is the lowest.

4.2.2 of EN 14511-3:2013 applies.

6.3 Uncertainties of measurement

4.3 of EN 14511-3:2013 applies. In addition, measurement uncertainties regarding the external water supply as defined in Table 7 apply.

Table 7 – Uncertainties of measurement for indicated values for an external water supply

Measured quantity	Unit	Uncertainty of measurement	
		Units with water tank	Units with continuous supply water circuit
Water flow rate	m^3/s	± 5 %	± 1 %
Water temperature	°C	± 1 K	± 0,1 K
Water static pressure	Pa	-	± 5 %
Water capacity	l	± 1 %	-

6.4 Test procedure

6.4.1 General

The test conditions are given in Clause 5 of this standard. Other requirements in 4.4.1 of EN 14511-3:2013 apply.

6.4.2 Steady state condition

This condition is considered, obtained and maintained when all the measured quantities remain constant without having to alter the set values, for a minimum duration of 1 h, with respect to the tolerances given in Table 4 of EN 14511-3:2013 and Table 8 of this standard. Periodic fluctuations of measured quantities caused by the operation of regulation and control devices are permissible, on the condition that the mean value of these fluctuations does not exceed the permissible deviations listed in Table 4 of EN 14511-3:2013 and Table 8 of this standard.

Table 8 – Permissible deviations from set values for the external water supply

Measured quantity	Permissible deviation of the arithmetic mean values from set values	Permissible deviations of individual measured values from set values
Water temperature	± 1 K	± 2 K
Water static pressure	-	± 10 %

6.4.3 Output measurement for units with water tank

6.4.3.1 General

For units with a water tank the test procedure includes determining the water tank duration and the cooling capacity test.

6.4.3.2 Pre-conditioning period

Steady state conditions given in 6.4.2 shall be obtained and maintained at least for 1 h.

During this period it is permissible to:

— fill the tank several times;

— use a secondary circuit to automatically fill the tank.

6.4.3.3 Recording period

The recording period immediately follows the pre-conditioning period.

The output shall be measured in the steady state condition. Measurement duration shall be not less than 35 min.

The tank shall be sufficiently filled to operate the unit during the recording period without adding water.

During the recording period, either of the following recordings are carried out:

— continuous weighting of the tank;

— continuous weighting of the total unit;

— weight the unit before and after the 35 min of test and deduce the quantity of water used to determine the duration of the tank.

At the end of the recording period, the water consumption shall be determined.

The water tank operating time shall be calculated by dividing the total water capacity of the water tank by the water consumption.

6.4.3.4 Determination of cooling performance

If the water tank operating time is equal or higher than 4 h, the unit shall be designated in accordance with Clause 4 and its cooling capacity, effective power input, EER measured according to 6.4.3 shall be considered valid.

If the unit can operate with an empty water tank, the output measurement shall be additionally performed with the water tank being empty in accordance with EN 14511.

If the water tank operating time is lower than 4 h and the unit can operate without water, the output measurement is performed with the water tank being empty in accordance with EN 14511 (all parts). The unit shall be designated in compliance with Clause 3 of EN 14511-1:2013.

6.4.4 Output measurement for units with continuous supply water circuit

6.4.4.1 Preconditioning period

Steady state conditions given in 6.4.2 shall be obtained and maintained at least for 1 h.

6.4.4.2 Recording period

The recording period immediately follows the preconditioning period.

The output shall be measured in the steady state condition. The measurement duration shall not be less than 35 min, and shall include an entire number of complete functioning cycles.

If a functioning cycle lasts 40 min the recording period should be 40 min; if a functioning cycle lasts 20 min the recording period should be 40 min so that the recording period includes an entire number of cycles (i.e. 2).

6.4.5 Data to be recorded

It is necessary to record all the meaningful data continuously. For recording instruments that operate on a cyclical basis, the sequence shall be adjusted so that a complete recording is effected at least once every 30 s.

The data to be recorded for the cooling capacity test are given in Table 6 of EN 14511-3:2013. In addition, data given in Table 9 shall be recorded.

Table 9 – Data to be recorded

Measured quantity	Unit	Unit with water tank	Unit with continuous water supply
Additional water static pressure	Pa		X
Additional water inlet temperature	°C	X	X
Additional water flow rate	m^3/s		X
Tank volume	l	X	
Water tank duration	min	X	

7 Electrical consumptions for single duct and double duct units

7.1 Determination of power consumption due to standby mode

The unit is switched in standby mode with the control device, if available. After 10 min, the residual energy consumption is measured and assumed to be the standby mode consumption, P_{SB}.

7.2 Determination of power consumption in off-mode

Following the standby mode test, the unit shall be switched onto off mode, if available, while remaining plugged in. After 10 min, the residual energy power is measured and assumed to be the off mode consumption, P_{OFF}.

7.3 Electricity consumption

The electricity consumption in cooling mode, Q_{SD} for single duct units and Q_{DD} for double duct units, shall be declared as the rated power input P_{EER} multiplied by the number of “on mode” hours as specified in the regulation and equal to 1.

It is expressed in kWh/h.

8 Air flow rate measurement of ducted units

For ducted units, the manufacturer shall declare the rated air flow rate, indoor and/or outdoor as applicable, measured according to Annex J of EN 14511-3:2013.

9 Test report

9.1 General information

6.1 of EN 14511-3:2013 applies.

9.2 Rating test results

The rating cooling capacities, power inputs, EER, internal and external static pressures, water consumption per hour or water tank duration shall be given with the rating conditions.

Table 10 provides a template for the test results to be reported for single duct and double duct units.

Table 10 – Table of test results for single duct and double duct units

Description	Symbol	Unit
Standard rating conditions, indoor air dry bulb (wet bulb) temperature	-	°C
Standard rating conditions, outdoor air dry bulb (wet bulb) temperature	-	°C
Rated capacity for cooling	P_{rated}	kW
Rated power input for cooling	P_{EER}	kW
Rated Energy efficiency ratio	EER_{rated}	-
Power consumption in off-mode	P_{OFF}	kW
Power consumption in standby mode	P_{SB}	kW
Electricity consumption in cooling mode - single duct unit - double duct unit	 Q_{SD} Q_{DD}	 kWh/h kWh/h

10 Requirements

Requirements defined in EN 14511-4 apply.

The starting test shall be carried out when the unit is operating with and without additional water, at the corresponding upper and lower limits of use specified by the manufacturer.

All other tests shall be carried out with the unit operating with additional water. In addition, for units with a water tank, it is permissible to fill the tank several times to complete the testing.

11 Marking

The information to be put on the permanently fixed rating label of the unit is defined in Clause 5 of EN 14511-4:2013. For units that operate with or without additional water, the two corresponding set of data shall be indicated on the rating label.

For evaporatively cooled condenser units with a continuous water supply circuit, the water consumption measured at the same rating conditions as for the measurement of cooling capacity and expressed in litre per hour shall be indicated on the rating label.

For evaporatively cooled condenser units with water tank the water tank duration measured at the same rating conditions as for the measurement of cooling capacity and expressed in minutes shall be indicated on the rating label.

12 Instructions

The relevant requirements of Clause 7 of EN 14511-4:2013 apply.

As regards maintenance, the manufacturer shall recommend:

— frequency of inspection of the evaporatively cooled condenser (frequency should be tailored on the basis of the quality of the water supplied to the evaporatively cooled condenser);

— guidance for the cleaning of the evaporatively cooled condenser, specifying whether this activity can be performed by the end-user or by a technician.

Annex ZA
(informative)

Relationship between this European Standard and the requirements of Commission Regulation (EC) No 206/2012

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to requirements of *Commission Regulation (EC) No 206/2012 of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for air conditioners*.

Once this standard is cited in the Official Journal of the European Union under that Commission Regulation, compliance with the clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding requirements of that and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Commission Regulation (EC) No 206/2012

Clauses and subclauses of this EN	Requirements of Commission Regulation (EC) No 206/2012	Qualifying remarks/Notes
5, Table 3 or Table 4 6,	Minimum energy efficiency for double duct and single duct air conditioners, EER_{rated}	
7.1 7.2	Maximum power consumption in off-mode standby mode (for single duct and double duct air conditioners, P_{OFF} and P_{SB}	
5, Table 3 or Table 4 6 7.1 7.2 7.3	Product information requirements for single duct and double duct air conditioners	
8	Product information requirements for air conditioners except single duct and double duct air conditioners	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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