

Contents

Page

European foreword.....	4
1 Scope.....	5
2 Normative references.....	5
3 Terms and definitions.....	6
4 Symbols and abbreviations.....	9
5 Installation requirements.....	11
5.1 Test apparatus and uncertainties of measurement.....	11
5.2 Test room for the outdoor heat exchanger of air source heat pumps.....	13
5.3 Installation and connection of the heat pump.....	13
5.4 Installation of heat pumps consisting of several parts.....	13
6 Settings and test conditions.....	14
6.1 General.....	14
6.2 Settings for non-ducted air source units.....	14
6.3 Setting the external static pressure difference for ducted air source units.....	14
6.4 Setting the difference of temperature for heat pumps using a liquid as heat source.....	14
6.5 Test conditions.....	15
6.5.1 General test conditions.....	15
6.5.2 Additional test conditions.....	15
7 Performance tests.....	18
7.1 General.....	18
7.2 Basic principles.....	18
7.3 Off-peak products.....	19
7.4 Power input corrections.....	19
7.4.1 Power input of fans for heat pumps with duct connection.....	19
7.4.2 Power input of liquid pumps.....	20
7.5 Stabilization [stage A].....	21
7.6 Filling and storage [stage B].....	21
7.7 Filling and heating up period [stage C].....	22
7.8 Standby power input [stage D].....	22
7.9 Water draw-offs and COP calculation [stage E].....	23
7.9.1 Determination of the useful energy.....	23
7.9.2 Determination of the electrical energy consumption (W_{EL-LP}).....	25
7.9.3 Coefficient of performance (COP_{DHW}).....	26
7.10 Reference hot water temperature and volume of mixed water at 40 °C [stage F].....	26
7.11 Calculation of the smart control factor SCF.....	27
7.11.1 General.....	27
7.11.2 Smart Control Test procedure.....	27
7.12 Determination of the ambient correction term Q_{COR}	31
7.13 Water heating energy efficiency η_{wh}	32
7.13.1 Determination of Q_{elec}	32
7.13.2 Calculation of η_{wh} for heat pump water heaters and heat pump combination water heaters.....	32

7.13.3	Calculation of the Annual Consumption of electric energy	33
7.14	Other performance.....	34
7.14.1	Rated heat output	34
7.14.2	Seasonal coefficient of performance ($SCOP_{DHW}$)	34
8	Other tests	35
8.1	Temperature operating range	35
8.2	Outside the operating range	36
8.3	Safety devices checking test.....	36
8.3.1	General	36
8.3.2	Shutting off the heat transfer medium flows	36
8.3.3	Complete power supply failure	37
8.4	Condensate draining.....	37
9	Test results and test report.....	37
9.1	Data to be recorded.....	37
9.2	Test report	40
9.2.1	General information	40
9.2.2	Main results	41
10	Marking	41
11	Documentation	42
11.1	Technical data sheet.....	42
11.1.1	General description	42
11.1.2	Performance characteristics	42
11.2	Instructions.....	43
11.2.1	General	43
11.2.2	Physical description	43
11.2.3	Additional heating devices, if integrated in unit.....	43
11.2.4	Control and safety.....	43
11.2.5	Instructions for installation.....	44
11.2.6	Instructions for maintenance.....	44
	Annex A (normative) Load profiles	45
	Annex ZA (informative) Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 814/2013 aimed to be covered	50
	Annex ZB (informative) Relationship between this European Standard and and the energy labelling requirements of Commission Delegated Regulation (EU) No 812/2013 aimed to be covered.....	52
	Annex ZC (informative) Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 813/2013 aimed to be covered	54
	Annex ZD (informative) Relationship between this European Standard and the energy labelling requirements of Commission Delegated Regulation (EU) No 811/2013 aimed to be covered.....	55
	Bibliography	57

European foreword

This document (EN 16147:2017+A1:2022) 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 June 2023, and conflicting national standards shall be withdrawn at the latest by June 2023.

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 $\boxed{A_1}$ EN 16147:2017 $\langle A_1 \rangle$.

$\boxed{A_1}$ The main changes with respect to the previous edition are listed below:

- a) correction of the calculation of η_{wh} for heat pump water heaters and heat pump combination water heaters;
- b) correction of the calculation of the annual consumption of electric energy;
- c) completion of Annexes ZA, ZB, ZC and ZD in line with the standardization requests M/534 (water heaters) and M/535 (space heaters). $\langle A_1 \rangle$

This document includes Amendment 1 approved by CEN on 23 May 2021.

The start and finish of text introduced or altered by amendment is indicated in the text by tags $\boxed{A_1}$ $\langle A_1 \rangle$.

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 Annexes ZA, ZB, ZC and ZD, which are an integral part of this document.

Note that the following provides details of significant technical changes between this document and the previous edition:

- d) re-structuring of the standard into the Clause 5 “Installation requirements”, Clause 6 “Settings and test conditions”, Clause 7 “Performance tests”, Clause 8 „Other tests“ and Clause 9 „Test results and test report“;
- e) update of Table 1 “Uncertainties of measurement for indicated values” in terms of units;
- f) update of the performance test regarding the stages (i.e. A. to F.) and the order of the tests (see 7.2);
- g) introduction of 7.11 “Calculation of the smart control factor SCF” and 7.12 „Determination of the ambient correction term Q_{cor} “ on the basis of the European Standard EN 50440:2015;
- h) introduction of 7.13.3 “Calculation of the Annual Consumption of electric energy”;
- i) re-allocation and revision of the former “tapping cycles” into the new annex “Load profiles” (see Tables A.1 to A.3);

- j) introduction of 7.14 “Other performances” regarding rated heat output and seasonal coefficient of performance;
- k) addition of the Annex ZA and Annex ZB for the relationship between this European Standard and the requirements of Commission Regulation (EU) No 814/2013 and (EU) No 812/2013;
- l) addition of the Annex ZC and Annex ZD for the relationship between this European Standard and the requirements of Commission Regulation (EU) No 813/2013 and (EU) No 811/2013.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document specifies methods for testing, rating of performance and calculation of water heating energy efficiency of air/water, brine/water, water/water and direct exchange/water heat pump water heaters and heat pump combination heaters with electrically driven compressors and connected to or including a domestic hot water storage tank for domestic hot water production.

This document comprises only the testing procedure for the domestic hot water production of the heat pump system.

NOTE 1 Testing procedures for simultaneous operation for domestic hot water production and space heating are not treated in this standard. Simultaneous means that domestic hot water production and space heating generation occur at the same time and may interact.

NOTE 2 For heat pump combination heaters the seasonal efficiency of space heating is determined according to EN 14825.

This document only applies to water heaters which are supplied in a package of heat pump and storage tank. In the case of water heaters consisting of several parts with refrigerant connections, this European Standard applies only to those designed and supplied as a complete package.

This document does not specify requirements of the quality of the used water.

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.

[A1] EN 14511-1:2018, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 1: Terms and definitions*

EN 14511-2:2018, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 2: Test conditions*

EN 14511-3:2018, *Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors - Part 3: Test methods*