



NSAI
Standards

Irish Standard
I.S. EN 16147:2017&AC:2017

Heat pumps with electrically driven compressors - Testing, performance rating and requirements for marking of domestic hot water units

I.S. EN 16147:2017&AC:2017

Incorporating amendments/corrigenda/National Annexes issued since publication:

EN 16147:2017/AC:2017

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN 16147:2017

Published:

2017-01-11

This document was published under the authority of the NSAI and comes into effect on:

2017-06-18

ICS number:

27.080

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN 16147:2017&AC:2017 is the adopted Irish version of the European Document EN 16147:2017, Heat pumps with electrically driven compressors - Testing, performance rating and requirements for marking of domestic hot water units

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

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

EUROPEAN STANDARD

EN 16147:2017/AC

NORME EUROPÉENNE

May 2017

EUROPÄISCHE NORM

Mai 2017

Mai 2017

ICS 27.080

English version
Version Française
Deutsche Fassung

Heat pumps with electrically driven compressors - Testing, performance rating and requirements for marking of domestic hot water units

Pompes à chaleur avec compresseur entraîné par moteur électrique - Essais, détermination des performances et exigences pour le marquage des appareils pour eau chaude sanitaire

Wärmepumpen mit elektrisch angetriebenen Verdichtern - Prüfungen, Leistungsbemessung und Anforderungen an die Kennzeichnung von Geräten zum Erwärmen von Brauchwarmwasser

This corrigendum becomes effective on 31 May 2017 for incorporation in the official English and French versions of the EN.

Ce corrigendum prendra effet le 31 mai 2017 pour incorporation dans les versions officielles anglaise et française de la EN.

Die Berichtigung tritt am 31. Mai 2017 zur Einarbeitung in die offizielle Englische und Französische Fassung der EN in Kraft.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

© 2017 CEN All rights of exploitation in any form and by any means reserved worldwide for CEN national Members.
Tous droits d'exploitation sous quelque forme et de quelque manière que ce soit réservés dans le monde entier aux membres nationaux du CEN.
Alle Rechte der Verwertung, gleich in welcher Form und in welchem Verfahren, sind weltweit den nationalen Mitgliedern von CEN vorbehalten.

Ref. No.:EN 16147:2017/AC:2017 E/F

EN 16147:2017/AC:2017 (E)

1 Correction to 4 – symbols and abbreviations

In entry $f(t)$, add the following to the end of the entry in 'description':

"during draw-off".

2 Correction to 7.11.2.6, formula 19

In formula 19:

Replace

$$Q_{LP}^{ref} = \int_{i=1}^{7n} Q_{LP}^{ref} [i]$$

With

$$Q_{LP}^{ref} = \sum_{i=1}^{7n} Q_{LP}^{ref} [i]$$

3 Correction to 7.14.2

In line 2, after 'Table 4 and':

Delete

"average"

And replace with

"the specified"

4 Correction to Annex ZB

Throughout the annex, excluding (Ecodesign Water Heaters)

Replace

"ecodesign"

with

"energy labelling"

Insert (throughout the Annex)

"Delegated"

Between

"Commission" and "Regulation"

5 Corrections to Annex ZD

Throughout the annex, excluding (Ecodesign Space Heaters)

Replace

"ecodesign"

with

"energy labelling"

Insert (throughout the Annex)

"Delegated"

Between

"Commission" and "Regulation"

This page is intentionally left blank

EUROPEAN STANDARD

EN 16147

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2017

ICS 27.080

Supersedes EN 16147:2011

English Version

Heat pumps with electrically driven compressors - Testing, performance rating and requirements for marking of domestic hot water units

Pompes à chaleur avec compresseur entraîné par
moteur électrique - Essais, détermination des
performances et exigences pour le marquage des
appareils pour eau chaude sanitaire

Wärmepumpen mit elektrisch angetriebenen
Verdichtern - Prüfungen, Leistungsbemessung und
Anforderungen an die Kennzeichnung von Geräten
zum Erwärmen von Brauchwarmwasser

This European Standard was approved by CEN on 8 October 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

This document consolidates EN 16147:2017 and the corrigendum EN 16147:2017/AC:2017



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

European foreword.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Symbols and abbreviations	10
5 Installation requirements.....	12
5.1 Test apparatus and uncertainties of measurement	12
5.2 Test room for the outdoor heat exchanger of air source heat pumps	13
5.3 Installation and connection of the heat pump.....	14
5.4 Installation of heat pumps consisting of several parts.....	14
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	15
6.4 Setting the difference of temperature for heat pumps using a liquid as heat source	15
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].....	21
7.8 Standby power input [stage D]	22
7.9 Water draw-offs and COP calculation [stage E]	22
7.9.1 Determination of the useful energy.....	22
7.9.2 Determination of the electrical energy consumption (W_{EL-LP}).....	24
7.9.3 Coefficient of performance (COP_{DHW})	25
7.10 Reference hot water temperature and volume of mixed water at 40 °C [stage F].....	25
7.11 Calculation of the smart control factor SCF	26
7.11.1 General.....	26
7.11.2 Smart Control Test procedure.....	26
7.12 Determination of the ambient correction term Q_{COR}	30
7.13 Water heating energy efficiency η_{wh}	31
7.13.1 Determination of Q_{elec}	31
7.13.2 Calculation of η_{wh} for heat pump water heaters and heat pump combination water heaters	31
7.13.3 Calculation of the Annual Consumption of electric energy.....	31
7.14 Other performance	31

7.14.1	Rated heat output	31
7.14.2	Seasonal coefficient of performance ($SCOP_{DHW}$)	32
8	Other tests	32
8.1	Temperature operating range	32
8.2	Outside the operating range	33
8.3	Safety devices checking test.....	33
8.3.1	General	33
8.3.2	Shutting off the heat transfer medium flows	33
8.3.3	Complete power supply failure	34
8.4	Condensate draining.....	34
9	Test results and test report.....	34
9.1	Data to be recorded.....	34
9.2	Test report	36
9.2.1	General information	36
9.2.2	Main results	37
10	Marking	38
11	Documentation	38
11.1	Technical data sheet.....	38
11.1.1	General description	38
11.1.2	Performance characteristics	38
11.2	Instructions.....	39
11.2.1	General	39
11.2.2	Physical description	39
11.2.3	Additional heating devices, if integrated in unit.....	39
11.2.4	Control and safety.....	39
11.2.5	Instructions for installation.....	40
11.2.6	Instructions for maintenance.....	40
Annex A (normative)	Load profiles	41
Annex ZA (informative)	Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 814/2013 aimed to be covered	46
Annex ZB (informative)	Relationship between this European Standard and and the ecodesign requirements of Commission Regulation (EU) No 812/2013 aimed to be covered	48
Annex ZC (informative)	Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 813/2013 aimed to be covered	49
Annex ZD (informative)	Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 811/2013 aimed to be covered	50
Bibliography	52
Figures		
Figure 1	— Stages and order of the tests	18
Figure 2	— Illustration of a test for one possible load profile	23
Figure 3	— Test procedure for “SMART CYCLE”	27
Tables		
Table 1	— Uncertainties of measurement for indicated values.....	13

EN 16147:2017 (E)

Table 2 — Variations allowed for the test conditions when the heat pump is running	15
Table 3 — Test conditions applicable to all systems.....	16
Table 4 — Test conditions for particular types of systems.....	17
Table 5 — Maximum ventilation exhaust air available dependent on declared load profile.....	17
Table 6 — Example of a series of load profiles	28
Table 7 — <i>k</i> -values.....	30
Table 8 — Operating conditions	32
Table 9 — Determination of wet bulb temperature related to dry bulb temperature	33
Table 10 — Data to be recorded.....	34
Table 11 — Additional data to be recorded for smart cycle test.....	36
Table 12 — Presentation of main results	37
Table A.1 — Load profiles 3 XS to S.....	41
Table A.2 — Load profiles M to XL.....	42
Table A.3 — Load profiles XXL to 4 XL.....	44
Table ZA.1 — Correspondance between this European Standard and Commission Regulation (EU) No 814/2013 Correspondence between this European Standard and Commission Regulation (EU) No 814/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for water heaters and hot water storage tanks and Commission’s standardization request M/534 (Ecodesign Water Heaters)	46
Table ZB.1 — Correspondence between this European Standard and Commission Regulation (EU) No 812/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of water heaters, hot water storage tanks and packages of water heater and solar device and Commission’s standardization request Full reference to the request ‘M/534 (Ecodesign Water Heaters).....	48
Table ZC.1 — Correspondence between this European Standard and Commission Regulation (EU) No 813/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters and Commission’s standardization request M/535 (Ecodesign Space Heaters)	49
Table ZD.1 — Correspondence between this European Standard and Commission Regulation (EU) No 811/2013 of 18 February 2013 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device and Commission’s standardization request Full reference to the request M/535 (Ecodesign Space Heaters)	50

European foreword

This document (EN 16147:2017) 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 July 2017, and conflicting national standards shall be withdrawn at the latest by July 2017.

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 16147:2011.

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.

This document includes the corrigendum EN 16147:2017/AC:2017, which corrects the description for entry $f(t)$, the text in clause 7.14.2, the formula (19) in clause 7.11.6, and the templates for Annexes ZB and ZD.

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

- a) 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“;
- b) update of Table 1 "Uncertainties of measurement for indicated values" in terms of units;
- c) update of the performance test regarding the stages (i.e. A. to F.) and the order of the tests (see 7.2);
- d) 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;
- e) introduction of 7.13.3 "Calculation of the Annual Consumption of electric energy";
- f) re-allocation and revision of the former "tapping cycles" into the new annex "Load profiles" (see Tables A.1 to A.3);
- g) introduction of 7.14 "Other performances" regarding rated heat output and seasonal coefficient of performance;
- h) 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;
- i) 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.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 16147:2017 (E)

1 Scope

This European Standard 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 European Standard 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 European Standard 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 European Standard 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.

EN 14511-1, *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, *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - Part 3: Test methods*

EN 60204-1, *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1)*

EN 60335-2-40, *Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers (IEC 60335-2-40)*

EN 61000-3-11, *Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current ≤ 75 A and subject to conditional connection (IEC 61000-3-11)*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-