

DIN EN 16147:2017-08 (E)

Heat pumps with electrically driven compressors - Testing, performance rating and requirements for marking of domestic hot water units (includes Corrigendum :2017)

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 \overline{AC} energy labelling \overline{AC} requirements of Commission \overline{AC} Delegated \overline{AC} 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 \overline{AC} energy labelling \overline{AC} requirements of Commission \overline{AC} Delegated \overline{AC} 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
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 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 ^{AC} Delegated ^{AC} 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 ^{AC} Delegated ^{AC} 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 M/535 (Ecodesign Space Heaters)	50