

# 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
<b>1 Scope.....</b>	<b>6</b>
<b>2 Normative references.....</b>	<b>6</b>
<b>3 Terms and definitions .....</b>	<b>7</b>
<b>4 Symbols and abbreviations .....</b>	<b>10</b>
<b>5 Installation requirements.....</b>	<b>12</b>
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
<b>6 Settings and test conditions .....</b>	<b>14</b>
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
<b>7 Performance tests.....</b>	<b>18</b>
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 $\eta_{wh}$ .....	31
7.13.1 Determination of $Q_{elec}$ .....	31
7.13.2 Calculation of $\eta_{wh}$ 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
<b>Figures</b>		
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

<b>Table 1 — Uncertainties of measurement for indicated values.....</b>	<b>13</b>
<b>Table 2 — Variations allowed for the test conditions when the heat pump is running .....</b>	<b>15</b>
<b>Table 3 — Test conditions applicable to all systems.....</b>	<b>16</b>
<b>Table 4 — Test conditions for particular types of systems.....</b>	<b>17</b>
<b>Table 5 — Maximum ventilation exhaust air available dependent on declared load profile.....</b>	<b>17</b>
<b>Table 6 — Example of a series of load profiles .....</b>	<b>28</b>
<b>Table 7 — <i>k</i>-values.....</b>	<b>30</b>
<b>Table 8 — Operating conditions .....</b>	<b>32</b>
<b>Table 9 — Determination of wet bulb temperature related to dry bulb temperature .....</b>	<b>33</b>
<b>Table 10 — Data to be recorded.....</b>	<b>34</b>
<b>Table 11 — Additional data to be recorded for smart cycle test.....</b>	<b>36</b>
<b>Table 12 — Presentation of main results .....</b>	<b>37</b>
<b>Table A.1 — Load profiles 3 XS to S.....</b>	<b>41</b>
<b>Table A.2 — Load profiles M to XL.....</b>	<b>42</b>
<b>Table A.3 — Load profiles XXL to 4 XL .....</b>	<b>44</b>
<b>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) .....</b>	<b>46</b>
<b>Table ZB.1 — Correspondence between this European Standard and Commission <sup>AC</sup> Delegated <sup>AC</sup> 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) .....</b>	<b>48</b>
<b>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) .....</b>	<b>49</b>
<b>Table ZD.1 — Correspondence between this European Standard and Commission <sup>AC</sup> Delegated <sup>AC</sup> 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) .....</b>	<b>50</b>