

# **Basic Criteria for Award of the Environmental Label**

## **Energy-Efficient Heat Pumps**

**RAL-UZ 118**



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**Prolongation for 1 year (until 31.12.2015) without any change**  
**Prolongation for 2 years (until 31.12.2017) without any change**

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# 1 Preface

**1.1** In cooperation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the Federal Environmental Agency and considering the results of the expert hearings conducted by RAL, the Environmental Label Jury has set up these Basic Criteria for the Award of the Environmental Label. RAL has been tasked with awarding the Environmental Label.

Upon application to RAL and on the basis of a Contract on the Use of the Environmental Label to be concluded with RAL, the permission to use the Environmental Label may be granted to all products, provided that they comply with the requirements as specified hereinafter.

**1.2** The environmental benefits of heat pumps lie in the fact that they help save fossil fuels by the use of renewable heat sources (e.g. water, ground heat (brine), air/exhaust air). Therefore, this environmental label can be used to identify those heat pump systems that cause significantly less emissions in the generation of heating energy than is required by the applicable standards or is usual from other heating technologies.

The emissions from heat pumps, often in the form of fluorinated hydrocarbons used as refrigerants, are damaging to the climate when they are released into the atmosphere. The use of natural refrigerants makes it possible to achieve significant improvements in the carbon footprint of heat pumps. The detrimental effect of a substance on the climate is evaluated by its global warming potential (GWP). The GWP values are based on CO<sub>2</sub> as a reference substance and measured over a time horizon of 100 years.

The energy efficiency of these systems is indicated by the annual performance factor<sup>1</sup> (APF) for those systems with electrically driven compressors and by the fuel utilisation efficiency ( $\eta_{\text{Fuel}}$ ) for those systems with gas-fired compressors for the relevant system (water, brine, air).

The TEWI (Total Equivalent Warming Impact) based on the thermal energy supplied (in kWh) is used to assess the ecological impact of heat pumps. This value describes the carbon footprint of the different emissions from a system, converted into CO<sub>2</sub> ("CO<sub>2</sub> equivalent" stated as CO<sub>2</sub>e) per unit (kilowatt hour, kWh) of heat generation. It takes into account both the proportion of the environmental impact caused by refrigerants

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<sup>1</sup> The annual performance factor describes the ratio of the thermal energy supplied by the electricity required to operate the system.

erant loss and also the proportion caused by the drive energy. This ensures that the emissions from environmentally harmful refrigerants can be evaluated as an overall balance. Furthermore, the climate-relevant methane emissions from gas engine driven heat pumps also need to be taken into account from 2015.

In the calculation of the TEWI, the APF or  $\eta_{\text{Fuel}}$ , the GWP and the filling quantity of the refrigerant, as well as the climate-relevant methane emissions from gas engine driven heat pumps from 2015, are taken as system-specific parameters.

## 2 Scope

These Basic Award Criteria are valid for:

- a) Heat pumps with electrically driven compressors according to EN 14511;
- b) Gas-fired absorption and adsorption heat pump devices according to DIN EN 12309;
- c) Gas-fired adsorption heat pumps according to DVGW VP 120;
- d) Ready-to-use heat absorption pumps according to DIN 33830;
- e) Ready-to-use heat pumps with internal combustion engine driven compressors according to DIN 33831;

with a rated thermal output of up to a max. 100 kW at a flow temperature of 35°C, which is exclusively driven by gaseous fuel and/or electrical energy. These Basic Award Criteria apply to factory-manufactured compact and split units that are used at least for space heating.

## 3 Requirements

The Environmental Label illustrated on the first page may be used for labelling of devices pursuant to Paragraph 2, provided that the following requirements are complied with:

### 3.1 Conformity with the guidelines

The prerequisite for the award of the Environmental Label is verification of conformity with the guidelines (e.g. Gas Appliances Directive) and the authorization to use the CE Label for the heat pump unit.

### **Compliance Verification:**

*The manufacturer shall verify compliance with the requirement by submitting the CE certificate.*

## **3.2 TEWI limits**

The climate damaging emissions from heat pumps are evaluated using a TEWI calculation based on system parameters. TEWI describes the total climatic impact, given as a CO<sub>2</sub> equivalent of the heat provided. By determining the TEWI limits instead of limits for the efficiency of the heat pump systems or the greenhouse gas potential of the refrigerant, it is possible to compensate for emissions from refrigerants with a high greenhouse gas potential through very low energy-related emissions (systems with high efficiency levels) and vice versa.

The applicant must verify that the TEWI of a heat pump system does not exceed at least one of the required limits stated in **Table 1**<sup>2</sup>.

Compliance with these values can be achieved by:

- the use of refrigerants with a low GWP in energy-efficient products (current standard) or
- through further increases in the energy efficiency of products using refrigerants with a high GWP.

The TEWI is to be calculated in accordance with Supplement A of these Basic Award Criteria.

**Table 1: TEWI Limits**

Type of heat pump system	TEWI
Flow temperature of the water W (35 or 55 °C)	[g CO <sub>2</sub> e/kWh]
Electrically driven heat pumps with brine or water as a heat source, W35	143
Electrically driven heat pumps with air as a heat source, W35; and Gas-fired heat pumps / sorption heat pumps, W35	178
Gas-fired heat pumps / sorption heat pumps, W55	218

Remark: Gas condensing boilers according to RAL-UZ 61 (new version 2011/12) achieve a TEWI of approx. 230 g/kWh (W40) or 240 g/kWh (W55)

<sup>2</sup> In gas-fired heat pumps, already available measurement values for the flow temperature W35 or W55 can be used, for which different limit values apply in each case.

### Compliance verifications:

The following information is to be documented in the declaration from the applicant:

- a) Information on the product specification for the refrigerant (description or composition of the refrigerant and the resulting GWP value) and the standard filling quantity of the refrigerant;
- b) the calculation of the TEWI in accordance with Supplement A;
- c) Information on the calculation and verification of the APF or  $\eta_{\text{Gas}}$  in accordance with the test list in Supplement B.

## 3.3 Noise emissions

The evaluation of the noise emissions is based on the provision of the guaranteed A-weighted sound power level in decibels (dB(A)) to one decimal place. The noise emission from externally installed heat pumps up to 20 kW of rated thermal output may not exceed the following sound power level<sup>3</sup>:

$$L_{WAd} \leq 17 + 36 \cdot \log(P_N + 10)$$

### Compliance Verification:

The guaranteed A-weighted sound power level  $L_{WAd}$  is to be measured in accordance with EN 12102 and adjusted using the calculated correction factor according to ISO 4871. The measurement results are to be quoted in the product documentation.

## 3.4 Emission requirements for heat pumps

- 3.4.1 The carbon monoxide (CO) content in the exhaust gas must not exceed the limits stated in **Table 2**.
- 3.4.2 The content of nitrogen monoxide and nitrogen dioxide in the exhaust gas, expressed as nitrogen dioxide, must not exceed the limits stated in the column "Nitrogen oxides (NOx)" in **Table 2**.

**Table 2: Emission Requirements**

Type	Carbon monoxide (CO)	Nitrogen oxides (NOx)
Gas-fired heat pumps (external combustion)	20 mg/kWh	40 mg/kWh
Gas engine driven heat pumps (internal combustion)	100 mg/Nm <sup>3</sup>	100 mg/Nm <sup>3</sup>
<b>Remark:</b> All limits are based on a residual oxygen content of 0%.		

<sup>3</sup> Heat pumps with higher thermal output levels are not subject to any limit in these Basic Award Criteria because they are considered to be industrial applications subject to the German Technical Instructions on Noise Abatement (TA Lärm).

Remark: It was agreed in the expert hearings that methane emissions should be determined and documented as a basis for the TEWI calculation from 2015. The measurement of the methane emissions should be carried out in accordance with VDI 2466.

**Compliance verifications:**

- a) *The emissions are to be determined as standard emission factors for heating operation in accordance with DIN 4702-8 and stated in both mg/kWh and mg/Nm<sup>3</sup>.*
- b) *In contrast to the test points and temperature pairs in DIN 4702-8, the same test points and temperature pairs for the calculation of the gas utilisation efficiency in accordance with Paragraph 3.4.1 of these Basic Award Criteria are to be used and stated in the report.<sup>4</sup>*
- c) *Measurement equipment in accordance with DIN EN 267 is to be used. In contrast to Paragraph 6.5 of DIN EN 267, the measurement equipment used for the NOx measurement should be based on the chemiluminescence principle. The CO measurement is to be carried out with measurement equipment based on infra-red spectroscopy.*

### 3.5 Circulator pumps

If the heat pump is sold with an integrated heat or brine circulator pump, this is to be realised using highly efficient, variable speed circulator pumps. These pumps must have an energy efficiency index of  $EEI \leq 0.27$  in accordance with EU regulation 2009/641/EG.

**Compliance Verification**

*In the case of integrated circulator pumps, the energy efficiency index (EEI) in accordance with the EU regulation 2009/641/EG is to be specially stated for these components in the test report and verified using the relevant measurements or a manufacturer's certificate.*

### 3.6 Installation and setting instructions (documentation for tradesmen)

- 3.6.1 The **installation and setting instructions** must contain clear and unambiguous statements about the correct installation and setting of the heat pump by a specialist.

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<sup>4</sup> It is anticipated that these test points in accordance with EN 14825 will be made obligatory at a European level by a regulation for the implementation of the energy consumption labelling directive 2010/30/EU and the eco-design directive 2009/125/EG. In addition, the selection of these test points makes it possible to carry out the emission measurements and the measurements for the efficiency level at the same time.

- 3.6.2 They must be clearly labelled on the title page as instructions "for specialist personnel".
- 3.6.3 An installation according to these installation and setting instructions must enable the efficient and low-emission operation of the system.
- 3.6.4 The installation and setting instructions for the heat pumps must include information on coordinating the devices with the exhaust gas system.
- 3.6.5 The documentation provided for the tradesmen must include a chapter in the table of contents on requirements for the heating water. This chapter should include the following statements to this effect:
- a) "The use of this device may require possible treatment of the heating water."
  - b) "The decision about whether this treatment is necessary is to be taken by the specialist tradesman based on the BDH/ZVSHK specialist information sheet "Stone formation" (Steinbildung)."
  - c) In the same position in the documentation, the precise method for the possibly required water treatment is to be explained.
- 3.6.6 A clear statement is to be made about whether the heat pump is suitable for the heating of drinking water. If this is the case, the additional following information is to be given in the installation and setting instructions:
- a) The following performance levels are stated in the documentation:
    - For air/water heat pumps: A2/W55;
    - For brine/water heat pumps: B0/W55;
      - alternatively for water in an internal circuit: B4/W55;
    - For water/water heat pumps: W10/W55;
    - For direct evaporation heat pumps: E4/W55.
  - b) The installation and setting instructions contain information on the requirements in worksheet DVGW-W 551 for avoiding the growth of legionella bacteria in drinking water heating systems, as well as information on the economic, hygienic and fault-free operation of the drinking water heating using the lowest possible volumes of water (smallest possible pipe diameter, fresh water technology) and the best possible insulation of the distribution pipes and hot water storage tank.
  - c) If the heat pump cannot achieve a hot water temperature of 60 °C without an electric auxiliary heater, the installation and setting instructions are to include the following sentence to this effect: "The use of an electric auxiliary heater is required to achieve a flow temperature of 60 °C."



- 3.6.7 In the interests of the energy-efficient operation of systems with integrated heat circulator pumps, the installation and setting instructions are to include information on the basic settings and functionality of the pumps.
- 3.6.8 If the heat pump is not fitted with an integrated heating or brine circulator pump, the installation and setting instructions must contain information that any external circulator pump to be installed should be a highly efficient and variable speed device with an  $EEL \leq 0.27$  in accordance with EU regulation 2009/641/EG or that the existing circulator pump should be replaced accordingly.
- 3.6.9 The installation and setting instructions should contain information on the completion of a hydraulic balancing process for the heating system as a prerequisite for achieving a high level of energy utilisation during operation.
- 3.6.10 The installation and setting instructions must contain information on the noise emissions and hints on avoiding structure-borne noise.

**Compliance Verification:**

*The applicant shall submit the installation and setting instructions in printed and digital form<sup>5</sup> and document the page numbers where the required information can be found in accordance with Supplement B of these Basic Award Criteria.*

### **3.7 Operating instructions for the end customer**

- 3.7.1 The operating instructions are to include information on the handling and maintenance of the system and the possibly included neutralisation system, as well as on the disposal of the materials used.
- 3.7.2 They must be clearly labelled on the title page as instructions "for the user".
- 3.7.3 The customer must be clearly instructed to ask a specialist tradesman whether it is permissible to fill the system with mains water.
  - a) If requirements have been set for the filling or refilling water in the documentation for the tradesman (e.g. documentation for the feed water quantity, softening) then this is to be clearly indicated. If reference is made to a specific regulation in relation to these requirements then the full contents of the regulation are to be printed in the end customer documentation. Alternatively, it can be clearly pointed out that the refilling or filling of the system may only be carried out by a specialist company/tradesman.
  - b) The consequences resulting from non-observance of this instruction should be clearly noted (e.g. significantly shorter service life).

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<sup>5</sup> The digital version is to be submitted as a PDF file on a CD-ROM.

- 3.7.4 The operating instructions contain information on the proper disposal of the system, as well as the materials and refrigerant contained within it.
- 3.7.5 The requirements in Paragraphs 3.6.6 to 3.6.8 of these Basic Award Criteria also apply to the operating instructions.

**Compliance Verification:**

*The applicant shall submit the operating instructions in printed and digital form<sup>6</sup> and document the page numbers where the required information can be found in accordance with Supplement B of these Basic Award Criteria.*

### **3.8 Environmentally-friendly product design**

- 3.8.1 Insofar as there are no imperative technical reasons to the contrary, the following principles for the "design of recyclable technical products" are to be observed and described in writing:
- a) Avoidance of non-detachable material connections between different materials;
  - b) Avoidance of composite materials;
  - c) Easy dismantling of components, also for the purpose of carrying out repairs easily;
  - d) Reduction of material diversity.
- 3.8.2 In addition, the manufacturer must declare compliance in writing with the following requirements when making the application for the Environmental Label:
- a) Product components made out of plastic with a weight greater than 50g must be labelled with a symbol in accordance with DIN EN ISO 1043-1 or DIN ISO 1629 (rubber) or DIN ISO 2076 (chemical fibres).
  - b) Cadmium, lead, mercury, chrome (VI) or flame-retardant materials i.e. polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE), as listed in Article 4 of Regulation 2011/65/EU of the European Parliament and of the Council, may not be used in the systems. The tolerance limits listed in Annex II of Regulation 2011/65/EU are valid.
  - c) Flame fittings between refrigerant carrying components or pipes may not be used in the systems.

**Compliance Verification:**

*The manufacturer shall declare their compliance with the requirement.*

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<sup>6</sup> The digital version is to be submitted as a PDF file on a CD-ROM.

## **4 Tests**

The tests are to be carried out or confirmed by a manufacturer-independent testing institution (e.g. TÜV, VDE, university, refrigeration engineering university).

The measuring technology used is to be listed in the test report. Measurement uncertainties must be stated based on an error analysis of the measurement technology used.

## **5 Applicants and Parties Involved**

**5.1** Distributors of products according to Paragraph 2 shall be eligible for application.

**5.2** The following parties are involved in the award process:

RAL, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the federal state being home to the applicant's factory that manufactures the products to be marked with the ecolabel.

## **6 Use of the label**

**6.1** The terms governing the use of the Environmental Label by the applicant are stipulated by a Contract on the Use of the Environmental Label to be concluded with RAL.

**6.2** Within the scope of such contract, the applicant undertakes to comply with the requirements under Paragraph 3 while using the environmental label.

**6.3** Contracts on the Use of the Environmental Label are concluded to fix the terms for the certification of products under Paragraph 2. Such contracts shall run until December 31, 2017.

They shall be extended by periods of one year each, unless terminated in writing by March 31, 2017 or March 31 of the respective year of extension. After the expiry of the contract, the Environmental Label may neither be used for labelling nor for advertising purposes. This regulation shall not affect products being still in the market.

**6.4** The Contract on the Use of the Environmental Label shall specify:

**6.4.1** Applicant (Distributor)

**6.4.2** Brand/trade name, type description, rated thermal output range in kW.

## Appendix A to the Basic Award Criteria RAL-UZ 118: Calculating the TEWI

### 1 Electrically driven heat pumps

#### 1.1 TEWI

The TEWI is based on the thermal heat generated and is calculated as follows:

$$\text{TEWI/kWh} = \frac{\text{GWP} \cdot m \cdot (\text{ER} \cdot n + \alpha)}{P \cdot h \cdot n} + \frac{\beta_{\text{Strom}}}{\text{JAZ}} \quad (\text{parameters according to Table 1})$$

1)

**Table 1: Parameters for the calculation of the TEWI for electrically driven heat pumps**

Parameter	Abb.	Unit	Requirement
Global warming potential over 100 years	GWP	-	according to Paragraph 3 of this Supplement
Annual performance factor	APF	-	according to Paragraph 1.2 of this Supplement
Rated thermal output	P	kW	Testing points according to Table 2 of this Supplement
Filling quantity of refrigerant <sup>B</sup>	m	kg	according to the manufacturer's information <sup>A</sup>
Refrigerant emission rate	ER	%/a	2.50
Service life of the system	n	a	15
Refrigerant disposal loss rate	$\alpha$	%	20 <sup>7</sup>
Emission factor (for electricity)	$\beta_{\text{Electricity}}$	kgCO <sub>2</sub> /kWh	0.599 <sup>8</sup>
Full load hours per year	h	h/a	2,000
<p><b>A)</b> In direct evaporation heat pumps, the maximum quantity of the relevant refrigerant that can be used in the whole system is to be used.</p> <p><b>B)</b> In split systems, the filling quantity of the refrigerant is to be calculated with a simple split pipeline length of 10m.</p>			

#### 1.2 Calculation of the annual performance factor

- The annual performance factor is calculated in accordance with VDI 4650 Sheet 1.
- In the different types of devices, the performance measurements (thermal output [kW] and coefficient of performance (COP)) are to be completed in accordance

<sup>7</sup> The refrigerant disposal loss rate of 20% is valid provided that all legal regulations in accordance with Regulation (EC) No. 842/2006 on certain fluorinated greenhouse gases and the Chemicals Climate Protection Ordinance (Chemikalien-Klimaschutzverordnung) are observed.

<sup>8</sup> Source: Gemis 4.7, Process Netz-el-DE-lokal-HH/KV-2010.

with the EN 14511 standard. The performance measurements are to be carried out at the test points illustrated in Table 2.

**Table 2: Test points for the performance measurements**

Type	Test points
Water/Water	<b>W10/W35</b> , W10/55
Brine/Water	<b>B0/W35</b> , B0/55
Air/Water	A-7/W35, <b>A2/W35</b> , (A10/W35 or A12/W35 or A15/W35), A2/W55
Direct evaporation	<b>E4/W35</b> , E4/55
<b>Remarks:</b> In each of the <b>test points printed in bold</b> , the thermal output for the TEWI calculation is used.	

- c) For air/water heat pumps, the COP for the test point A10/W35 is required amongst other things. This can be calculated or determined using interpolation insofar as independent test bench measurement values are available for A12/W35 or A15/W35.
- d) The following assumptions are valid for the calculation:
1. Flow/return temperature: 35/ 28 °C;
  2.  $F_p$ : Factor for the preliminary planning in accordance with VDI 4650-1;
  3. For brine heat pumps, a ground heat collector system is assumed  $\rightarrow F_g$  (brine, room heating)=1.087;  $F_g$  (brine, hot water)=0.89;
  4. Standard outdoor temperature: -12 °C (Location: Würzburg);
  5. Heating threshold temperature (HT) for EnEV:2002-Building: 12 °C;
  6. Ratio of the room heat:  $x=0.82$ ; ratio of the hot water preparation  $y=0.18$ ;
  7. Depending on the design of the system, the possible use of an electric auxiliary heater (direct electricity heating) is estimated at a ratio of  $\alpha = 3 \%$  of the annual energy requirement.

## 2 Heat pumps

### 2.1 TEWI

The TEWI is based on the thermal heat generated and is calculated as follows (parameter according to Table 3):

$$\text{TEWI/kWh} = \frac{\text{GWP} \cdot m \cdot (\text{ER} \cdot n + \alpha)}{P \cdot h \cdot n} + \frac{\beta_{\text{Brennstoff}} + 20 \frac{\text{kg}_{\text{CO}_2}}{\text{kg}_{\text{Methan}}} \cdot \beta_{\text{Methan}}}{\eta_{\text{Brennstoff}}} + \beta_{\text{Strom}} \cdot q_{\text{Strom}}$$

**Table 3: Parameters for the calculation of the TEWI for heat pumps**

Parameter	Abb.	Unit	Requirement
Global warming potential over 100 years	GWP	kg <sub>CO2</sub> /kg <sub>KM</sub>	according to Paragraph 3 of this Supplement
Fuel utilization efficiency	$\eta_{\text{Fuel}}$	-	according to Paragraph 2.2 of this Supplement
Specific electrical auxiliary energy requirement	$q_{\text{Electricity}}$	-	according to Paragraph 2.3 of this Supplement
Rated thermal output	P	kW	according to Paragraph 2.2 of this Supplement
Filling quantity of refrigerant <sup>B</sup>	m	kg <sub>KM</sub>	according to the manufacturer's information <sup>A</sup>
Refrigerant emission rate	ER	%/a	2.50
Service life of the system	n	a	15
Refrigerant disposal loss rate	$\alpha$	%	20
CO <sub>2</sub> emission factor for electricity	$\beta_{\text{Electricity}}$	kg <sub>CO2</sub> /kWh	0.599 <sup>9</sup>
CO <sub>2</sub> emission factor for the fuel	$\beta_{\text{Fuel}}$	kg <sub>CO2</sub> /kWh	according to Table 4 of this Supplement
Emissions factor for methane emissions (obligatory from 2015)	$\beta_{\text{Methane}}$	kg <sub>Methane</sub> /kWh	according to Paragraph 3.4.1.3 of these Basic Award Criteria
Full load hours per year	h	h/a	2,000
<sup>A</sup> ) In direct evaporation heat pumps, the maximum quantity of the relevant refrigerant that can be used in the whole system is to be used. <sup>B</sup> ) In split systems, the filling quantity of refrigerant is to be calculated with a split pipeline length of 10m.			

**Table 4: Emission factors for different fuels or heat sources**

Type of energy	$\beta_{\text{Fuel}}$ [kg <sub>CO2</sub> /kWh]
Natural gas	0.246
Liquid gas	0.270
District heating	0.255
Source: Gemis 4.7 (incl. upstream chains)	

## 2.2 Calculation of the fuel utilisation efficiency

- a) The fuel utilisation efficiency ( $\eta_{\text{Fuel}}$ ) for the heating operation is to be calculated in accordance with EN 12309 for different test points. In contrast to the test points and temperature pairs defined in EN 12309, the test points and temperatures in accordance with EN 14825 for the reference heating period "A" (medi-

<sup>9</sup> Source: Gemis 4.7, Process Netz-el-DE-lokal-HH/KV-2010.

um), lines A to D or according to VDI 4650 Sheet 2 are to be selected.<sup>10</sup> Depending on the design of the system, the applicant can select here whether to use the test points for the "lower temperature" (W35) or the "higher temperature" (W55), whereby different TEWI limits apply in each case. The arithmetic mean is taken from the results of these four individual tests to calculate  $\eta_{\text{Fuel}}$ .

- b) If a regulation from the EU commission for the implementation of the eco-design directive 2009/125/EU introduces other test points and temperatures as being obligatory, these can then be used as an **alternative** to the measurements described above.
- c) The annual performance factor according to VDI 4650 Sheet 2 can be used as an alternative to  $\eta_{\text{Fuel}}$ . The following framework conditions apply:
  - 1. For groundwater as a heat source:  $t_{\text{Evap,on}}=10\text{ °C}$  insofar as it can be assumed that the system will generally be operated without an intermediate heat exchanger (otherwise  $t_{\text{Evap,on}}=7\text{ °C}$  in Table 3 VDI 4650-2);
  - 2. Standard outdoor temperature:  $-12\text{ °C}$  (Location: Würzburg);
  - 3. Ratio of the hot water preparation  $y=0.18$ .
- d) For **gas engine** heat pumps, the annual performance factor according to VDI 4650 Sheet 1 can be used as an alternative to  $\eta_{\text{Fuel}}$ . The framework conditions according to Paragraph 1.2 of this Supplement are valid.

## 2.3 Calculation of the auxiliary energy requirement

The electrical auxiliary energy requirement ( $E_{\text{el}}$  [kWh<sub>el</sub>]) is measured for every test point according to Paragraph 2.2 of this Supplement and divided by the heat supplied ( $Q_{\text{th}}$  [kWh<sub>th</sub>]). In order to calculate the specific electrical auxiliary energy requirement ( $q_{\text{Electricity}}$  [kWh<sub>el</sub>/kWh<sub>th</sub>]), an arithmetic mean of these calculated values is taken based on DIN 4702-8.

## 3 Global warming potential of refrigerants

For the TEWI calculations, the greenhouse gas potentials over 100 years taken from the Fourth Assessment Report of the IPCC ("AR4", 2007) are used. If GWP values for certain materials are not listed here then these are to be taken from the most recent IPCC publications.

<sup>10</sup> It is anticipated that these test points in accordance with prEN 14825 will be made obligatory at a European level by a regulation for the implementation of the energy consumption labelling directive 2010/30/EU.

The GWP values for refrigerant mixtures are to be determined based on the GWP for the individual material weighted by their relevant proportion by mass.

**Table 5** contains the GWP for the most commonly used refrigerants for heat pumps.

**Table 5: GWP of selected refrigerants**

Abb.	Description	GWP (100 a)
R32	Difluoromethane	675
R125	Pentafluoroethane	3,500
R143a	1,1,1-Trifluoroethane	4,470
R134a	Tetrafluoroethane	1,430
R152a	1,1-Difluoroethane	124
R365mfc	1,1,1,3,3-Pentafluorbutan	794
R43-10mee	1,1,1,2,3,4,4,5,5,5 decafluoropentane	1,640
R407C	R32/R125/R134a in the ratio 23/25/52	1,774
R410A	R32/R125 in the ratio 50/50	2,088
R404A	R125/R143a/R134a in the ratio 44/52/4	3,922
R417A	R125/R134a/R600 in the ratio 46.6/50/3.4	2,346
R290	Propane	3.3
R1270	Propene	1.8
R600	n-butane	4
R717	Ammonia	0
R718	Water	0
R723	Ammonia/Dimethyl Ether in the ratio 60/40	1
R744	Carbon dioxide	1



**Appendix B to the Basic Award Criteria RAL-UZ 118:  
Test results and manufacturer's declarations (separate form)**

This supplement is made available separately as a printed form.

# CONTRACT

## No. on the Award of the Environmental Label

RAL gGmbH as the label-awarding agency and the  
firm of

### (Applicant/Distributor)

as the applicant conclude the following  
Contract on the Use of the Environmental Label:

### S P E C I M E N

- Under the following conditions the applicant shall be entitled to use the Environmental Label for the labelling of the product / product group / project Energy-Efficient Heat Pumps for

"(Brand/trade name)"

This shall not include the right to use the Environmental Label as part of a brand. Unless otherwise agreed, the Environmental Label shall only be used in the above given shape and colour and shall be marked at the bottom "Jury Umweltzeichen" (Environmental Label Jury). The entire inner surrounding text shall always be identical as regards font size, form, thickness and colour and it shall be easy to read.

- The Environmental Label according to Paragraph 1 may only be used for the above-mentioned product / product group / project.
- If the Environmental Label is used for advertising purposes or other applicant activities, the applicant shall make sure that it is exclusively used in connection with the above-named product / product group / project for which the use of the Environmental Label has been granted and settled under this contract. The applicant shall be solely responsible for the way the label is used, above all, in advertising.
- During the entire period of label use, the product / product group / project to be labelled shall comply with all requirements and conditions for the use of the label as specified in the "Basic Criteria for Award of the Environmental Label RAL-UZ 118", as amended. This shall also apply to the reproduction of the Environmental Label (including surrounding text). Claims for damages against RAL gGmbH, especially on the grounds of third party objections to applicant's use of the label and the accompanying advertising shall be ruled out.
- If the "Basic Criteria for Award of the Environmental Label" provide for checks by third parties, the applicant shall bear the costs accruing in connection therewith.
- Should the applicant himself or third parties find out that the applicant does not comply with the conditions as stipulated in Paragraphs 2-5, the applicant shall be liable

to inform RAL gGmbH and stop the use of the Environmental Label until the conditions are complied with again. Should the applicant be incapable of restoring the state required for the use of the label immediately or should the applicant seriously offend against this contract RAL gGmbH may, if necessary, withdraw the Environmental Label and prohibit the applicant from using the label any longer. Claims for damages against RAL gGmbH because of the withdrawal of the label shall be ruled out.

- The Contract on the Use of the Environmental Label may be terminated for good reason.

Examples of good reasons are:

- unpaid contributions
- substantiated risk of injury and death.

In such case, the applicant's continued use of the Environmental Label shall be prohibited. The applicant shall not be entitled to bring a claim for damages against RAL gGmbH (see above: Paragraph 6, Sentence 3).

- The applicant undertakes to pay RAL gGmbH an amount according to the "Entgeltordnung für das Umweltzeichen" (Schedule of Fees for the Environmental Label), as amended, for the period of use.
- According to the "Basic Criteria for Award of the Environmental Label RAL-UZ 118" this contract will run until 31.12.2017. It shall be extended by periods of one year each, unless terminated in writing by March 31, 2017 or March 31 of the respective year of extension. After the expiry of the contract, the Environmental Label may neither be used for labelling nor for advertising purposes. This regulation shall not affect products being still in the market.
- Products / projects marked with the Environmental Label and the advertising for these products / projects may reach the consumer only when naming the company of the

(Applicant/Distributor)

Sankt Augustin, this ... day of .....20..

Place, Date

RAL gGmbH  
Management

(Signature of authorized person  
and company stamp)