

# **BLUE ANGEL**

**The German Ecolabel**



## **Household Energy Meters**

**DE-UZ 142**

**Basic Award Criteria**

**Edition September 2013**

**Version 3**

## The Environmental Label is supported by the following four institutions:



Federal Ministry  
for the Environment, Nature Conservation  
and Nuclear Safety

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety is the owner of the label. It regularly provides information on the decisions taken by the Environmental Label Jury.



The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labeling and Environmentally friendly Procurement" acts as office of the Environmental Label Jury and develops the technical criteria of the Basic Criteria for Award of the Blue Angel.



The Environmental Label Jury is the independent, decision-making body for the Blue Angel and includes representatives from environmental and consumer associations, trade unions, industry, the trade, crafts, local authorities, academia, the media, churches, young people and the German federal states.



The RAL gGmbH is the awarding body for the Environmental Label. It organises the process for developing the relevant award criteria in independent expert hearings – which involve all relevant interest groups.

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## Table of contents

|     |   |    |
|-----|---|----|
| 1   | Introduction.....   | 4  |
| 1.1 | Preface .....   | 4  |
| 1.2 | Background .....  | 4  |
| 1.3 | Objectives of the Environmental Label .....                                       | 4  |
| 2   | Scope .....   | 5  |
| 3   | Requirements .....  | 5  |
| 3.1 | Scope of Functions and Measuring Accuracies .....                                 | 5  |
| 3.2 | Own Power Consumption.....  | 6  |
| 3.3 | Safety Requirements .....   | 6  |
| 3.4 | Material Requirements for Electrical Components .....                             | 7  |
| 3.5 | Material Requirements for Plastics used in Casings and Parts Thereof.....         | 7  |
| 3.6 | Consumer Information .....  | 8  |
| 4   | Applicants and Parties Involved.....  | 9  |
| 5   | Use of the Environmental Label.....   | 9  |
|     | Appendix A Instructions for Active Power and Energy Consumption Measurements..... | 10 |

**This document is a translation of a German original. In case of dispute, the original document should be taken as authoritative.**

# **1 Introduction**

## **1.1 Preface**

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

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

The product must comply with all the legal requirements in the country in which it is to be marketed. The applicant shall declare that the product meets this requirement.

## **1.2 Background**

Unnecessary standby power consumption of household appliances can add up to 400 kWh per year and household. And the consumer is usually unable to tell how much energy the appliances use in various operating modes and whether the OFF mode is a standby mode or a complete separation from the mains. Energy meters enable the consumer to measure/determine the power usage ( $W_{el}$ ), energy consumption (kWh) and the related energy costs (€/a) of electric household appliances in all operating modes. This information will allow the consumer to consider further measures, such as the use of switchable power strips or the replacement of heavy power consuming appliances. Energy meters are easy-to-use and effective instruments for household use. They contribute to a more environmentally conscious use of electrical energy.

## **1.3 Objectives of the Environmental Label**

Reduction of energy consumption, minimization of standby power losses and a responsible usage of resources are major goals of environmental protection. On the one hand, the Blue Angel eco-label for household energy meters is to inform the consumer that the product group can support him or her in his or her energy saving efforts. On the other hand, the eco-label is to inform the consumer which energy meters are particularly suited to detect standby losses and identify heavy energy consuming appliances.

The Blue Angel eco-label for energy meters may be awarded to particularly high-quality devices featuring the following properties:

- High measuring accuracy
- Low own power consumption
- Safe and durable design
- Use of environmentally friendly materials
- Good documentation of the product properties

Therefore, following benefits for the environment and health are stated in the explanatory box:



[www.blauer-engel.de/uz142](http://www.blauer-engel.de/uz142)

- energy efficient
- low level of harmful materials
- high measuring accuracy

## 2 Scope

These Basic Award Criteria apply to energy meters intended for use by the end user on electric mains-operated appliances (230 VAC, 50–60 Hz). The energy meters must be so designed as to allow a professional electrician to put the device into operation and use without complex installation work. For this purpose, the devices must be provided with a three-pin plug and a three-pin socket which may be compactly housed in a casing. The energy meters must have their own - and possibly independent - displays from which the respective measured values can be read.

## 3 Requirements

### 3.1 Scope of Functions and Measuring Accuracies

The energy meters shall provide at least the following functions:

- Measurement and visual display of the electrical active power ( $W_{el}$ )
- Measurement and visual display of the electrical energy consumption (kWh)
- Calculation and visual display of the energy costs (€)
- Storage and visual display of the last measured accumulated values for at least 5 minutes after disconnection from the mains

The following requirements are placed on the measurement of the electrical active power:

- Measurement range for power values from 0.5 to 3680 watts at the most
- Measuring accuracy of the respective measured value of  $\pm 5\% \pm 0.5$  watts

The following requirements are placed on the measurement of the electrical energy consumption:

- Tolerance of the measured energy consumption compared to an A.C. meter with Class 1 accuracy according to DIN EN 62053-21 of  $\pm 5\%$
- Display for optional extrapolation from the measured energy consumption to annual energy consumption (kWh/a) or a detailed description of the calculation method in the product documentation

The following requirements are placed on the calculation and visual display of the energy costs:

- Option allowing the user to adjust the energy prices (€/kWh or Ct/kWh)
- Factory setting for an energy price that would be plausible for household customers at the time of delivery (e.g. 0.20 €/kWh for Germany in 2009)
- Display of the energy costs of the ongoing measurement
- Display for optional extrapolation from the ongoing measurement to annual energy costs (€/a) or a detailed description of the calculation method in the product documentation

### **Compliance Verification**

*Applicant shall declare compliance with the requirement and submit a measurement report from an independent testing laboratory for the measurement ranges and tolerances required.*

*The testing laboratory shall perform testing in accordance with the measurement instructions set out in Appendix A and prepare the measurement report by use of the attached sample.*

*Moreover, the applicant shall submit the corresponding pages of the product documentation specifying the requirements.*

### **3.2 Own Power Consumption**

The power consumption of the energy meters shall not exceed a maximum of 2 watts. The power consumption shall be determined on the ready-for-operation energy meter without device under test.

### **Compliance Verification**

*Applicant shall declare compliance with the requirement, give the own power consumption and submit a measurement report from an independent testing laboratory.*

*Moreover, the applicant shall submit the corresponding pages of the product documentation specifying the requirements.*

### **3.3 Safety Requirements**

The energy meters shall bear the CE Marking and thus comply with the requirements of the following European directives:

- 2006/95/EC Low Voltage Directive (LVD)
- 2004/108/EC Electromagnetic Compatibility Directive (EMC)

Moreover, the applicant shall produce evidence of the electrical safety of the energy meters by submitting the results of the following tests:

- Drop test according to DIN VDE 0620-1:2005-4, para. 24.2. The devices shall be subjected to a drop test and the damage shall be assessed by an expert. The devices shall meet the requirements of the standard.
- Warming under maximum load in accordance with DIN VDE 0620-1:2005-4, para. 19. The devices shall be operated over a test period of 1 hour using a test current of 20 A. The surface temperature and the deformability of the casing shall be determined. The devices shall meet the requirements of the standard.
- Measurement of the surface voltage in accordance with DIN EN 61010-1 (VDE 0411 Part 1):2002-08, para. 6.8. The voltage between active elements and surfaces that may be contacted shall be checked. The devices shall meet the requirements of the standard.

### **Compliance Verification**

*The applicant shall submit EU Conformity Declarations confirming compliance with the above-mentioned European Directives. To demonstrate compliance with the above mentioned requirements for electrical safety the applicant shall declare compliance with the requirement and submit a test report from a DIN EN ISO IEC 17025 accredited testing laboratory. The test reports shall document compliance with the requirements.*

### 3.4 Material Requirements for Electrical Components

Mercury-containing components shall not be used. This particularly applies to the device battery that may be required for data storage. If the energy meter is equipped with a device battery the latter must be easily exchangeable and the user shall be informed about the type of battery.

#### **Compliance Verification**

*Applicant shall declare compliance with the requirement and, if the energy meter is equipped with a device battery, give the battery type and submit the corresponding pages of the product documentation.*

### 3.5 Material Requirements for Plastics used in Casings and Parts Thereof

The plastics must not contain as constituent parts any substances classified as:

- a) carcinogenic in categories 1 or 2 according to Table 3.2 of Annex VI to EC Regulation 1272/2008<sup>1</sup>,
- b) mutagenic in categories 1 or 2 according to Table 3.2 of Annex VI to EC Regulation 1272/2008,
- c) reprotoxic in categories 1 and 2 according to Table 3.2 of Annex VI to EC Regulation 1272/2008,
- d) persistent, bioaccumulative and toxic (PBT substances) or very persistent and very bioaccumulative (vPvB substances) according to the criteria of Annex XIII to the REACH Regulation or particularly alarming for other reasons and included into the List (so-called list of candidates<sup>2</sup>) set up in accordance with REACH, Article 59, paragraph 1.

Halogenated polymers shall not be permitted. Neither may halogenated organic compounds be added as flame retardants. Moreover, additions of flame retardants labelled with the Risk Phrase R50/53 pursuant to Table 3.2 of Annex VI to EC Regulation 1272/2008 shall not be permitted.

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<sup>1</sup> Regulation (EC) No. 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006, Annex VI on harmonized classification and labelling of hazardous substances, Part 3: Harmonized classification and labelling, Tables, Table 3.2, – List of harmonized classification and labelling of dangerous substances from Annex I to Directive 67/548/EEC, short:  
GHS-Regulation [http://www.reach-info.de/ghs\\_verordnung.htm](http://www.reach-info.de/ghs_verordnung.htm), each as amended.

The GHS Regulation (Global Harmonization System), that has come into force on January 20, 2009, replaces the old Directives 67/548/EEC and 1999/45/EC. According to the said regulation, substances are classified, labelled and packed until December 1, 2010 according to Directive 67/548/EEC (Dangerous Substances Directive) while mixtures are classified, labelled and packed until June 1, 2015 according to Directive 1999/45/EC (Dangerous Preparations Directive). Notwithstanding this, the classification, labelling and packaging of substances and preparations may be performed according to the provisions of the GHS Regulation already before December 1, 2010 or June 1, 2015, respectively. In such case, the provisions of Dangerous Substances Directive or Dangerous Preparations Directive shall not be applicable.

<sup>2</sup> Link to the list of candidates of Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH):  
[http://echa.europa.eu/consultations/authorisation/svhc/svhc\\_cons\\_en.asp](http://echa.europa.eu/consultations/authorisation/svhc/svhc_cons_en.asp)

The following shall be exempt from this rule:

- process-related, technically unavoidable impurities;
- fluoroorganic additives (as, for example, anti-dripping agents) used to improve the physical properties of plastics, provided that they do not exceed 0.5 weight percent;
- plastic parts weighing less than 25 grams.

**Compliance Verification**

*Applicant shall declare compliance with the requirements. As regards the substances banned from use in plastics for casings and parts thereof applicant shall prompt the plastic manufacturers or suppliers to send a written declaration to RAL gGmbH stating that these substances have not been added. Also, the applicant undertakes to prompt the manufacturers or suppliers of the case plastics to confidentially report the chemical designation of the flame retardants used (CAS-No.) to RAL gGmbH.*

**3.6 Consumer Information**

The product documentation is of particularly great importance since only the targeted use of energy meters provides the desired consumer information and thus helps to save electrical energy.

- a) The product documentation shall provide detailed information on the operation of the device as well as on the various operating modes.
- b) The product documentation shall include the compliance verifications mentioned in the above-noted requirements referring to the product documentation (e.g. measuring range, measuring accuracy, own power consumption as well as the type of the device battery).

In the event that the energy meters do not provide display options for extrapolating annual energy consumption and annual energy costs according to para. 3.1, the product documentation shall include detailed and comprehensible information on the calculation method, as for example, in the following way:

- ◆ Daily energy costs [Euros per day] = Measured valued [Euro] / Test period [hours] \* 24 hours
- ◆ Annual energy costs [Euros per year] = Daily energy costs [Euros per day] \* 365 days
- ◆ Daily energy consumption [kWh per day] = Measured value [kWh] / Test period [hours] \* 24 hours
- ◆ Annual energy consumption [KWh per year] = Daily energy consumption [kWh per day] \* 365 days

- c) It is recommended that the product documentation complies with DIN EN 62079 to ensure easy readability of the consumer information (font size, spacing, etc.).
- d) Moreover, it is recommended that the product documentation includes an example table providing the following corresponding information in order to facilitate energy consumption measurement by the user:

| <b>Electrical Appliance</b> | <b>Power (watts)</b> | <b>Annual Energy Costs (Euro)</b> |
|-----------------------------|----------------------|-----------------------------------|
|                             |                      |                                   |
|                             |                      |                                   |



### **Compliance Verification**

*The applicant shall declare compliance with requirements a), b), c), submit the corresponding pages of the product documentation take note of requirements d) and e).*

## **4 Applicants and Parties Involved**

Manufacturers or distributors of final products according to Paragraph 2 shall be eligible for application.

Parties involved in the award process are:

- RAL gGmbH to award the Blue Angel Environmental Label,
- the federal state being home to the applicant's production site,
- Umweltbundesamt (German Environmental Agency) which after the signing of the contract receives all data and documents submitted in applications for the Blue Angel in order to be able to further develop the Basic Award Criteria.

## **5 Use of the Environmental Label**

The use of the Environmental Label by the applicant is governed by a contract on the use of the Environmental Label concluded with RAL gGmbH.

Within the scope of such contract, the applicant undertakes to comply with the requirements under Paragraph 3 while using the Environmental Label.

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, 2024. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2024 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.

The applicant (manufacturer) shall be entitled to apply to RAL gGmbH for an extension of the right to use the ecolabel on the product entitled to the label if it is to be marketed under another brand/trade name and/or other marketing organisations.

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

- Applicant (manufacturer/distributor)
- Brand/trade name, product description
- Distributor (label user), i.e. the above-mentioned marketing organisations.

## Appendix A Instructions for Active Power and Energy Consumption Measurements

### 1 Introduction

According to the Basic Award Criteria DE-UZ 142 „Household Energy Meters“, paragraph 3.1, compliance with the required measuring accuracy of the energy meter shall be established by means of a measurement report.

The present measurement instructions give a more detailed description of the individual measurements to be carried out. In addition to the measurement instructions set forth herein the testing laboratory shall meet the general requirements for the competence of testing and calibration laboratories according to DIN EN ISO/IEC 17025.

### 2 Setup for Active Power Measurement

The setup for active power measurement consists of a constant alternating voltage of 230 V  $\pm$  1% at 50 Hz  $\pm$  1%, the energy meter serving as device under test and defined test loads as listed in the table below. The loads represent typical electrical energy consumers in private households some of which show phase shifts and harmonics.

Measurements 6. to 8. shall be carried out by use of the test setup mentioned in para. 5 for a switching power supply.

Test Loads for a Measurement Cycle:

| No. | Target Value<br>Test Load | Target Value<br>Phase Shift                             |
|-----|---------------------------|---|
|     | [Watt]                    | [ - ]   |
| 1.  | 3000                      | $\cos \varphi = 1$                                      |
| 2.  | 1000                      | $\cos \varphi = 0.92$                                   |
| 3.  | 300                       | $\cos \varphi = 0.86$                                   |
| 4.  | 100                       | $\cos \varphi = 1$                                      |
| 5.  | 30                        | $\cos \varphi = 1$                                      |
| 6.  | 6                         | Acc. to the test setup<br>for switching power<br>supply |
| 7.  | 3                         |   |
| 8.  | 1                         |   |

Measurement is carried out by connecting the alternating voltage source, the energy meter and the defined test load and by reading the measured active power from the display after about 1 minute. Measurements are to be carried out as a measurement cycle in the given order (No. 1 to 8). The measurement cycle shall be repeated three times. After that, the arithmetic mean shall be calculated from the three measured values each and recorded in the measurement report according to para. 4.1.

Active power and phase shift shall be determined as  $\cos \varphi$  - value as comparison measurements for the same loads by use of a calibrated laboratory instrument and recorded in the measurement report pursuant to para. 4.1.

### **3 Setup for Energy Consumption Measurement**

The test setup for determining the tolerance of the energy consumption measurement consists of a constant alternating voltage of  $230\text{ V} \pm 1\%$  at  $50\text{ Hz} \pm 1\%$ , the energy meter serving as device under test and a defined test load drawing a constant current of  $10\text{ A}$  without phase shift ( $\cos \varphi = 1$ ).

The energy consumption measurement [Wh] on the device under test shall be performed over a period of 15.0 minutes and the energy consumption value displayed before the measurement ( $t = 0$ ) and after the measurement ( $t = 15\text{ min}$ ) shall be recorded. The difference value shall be recorded in the measurement report pursuant to para. 0.

For comparison measurement purposes the device under test shall be replaced by an A.C. meter with Class 1 accuracy according to DIN EN 62053-21 (or more accurate) and the measurement shall be repeated. Also the difference value shall be recorded in the measurement report pursuant to para. 0.

## 4 Measurement Report

### 4.1 Active Power Measurement Report

Type designation of the device under test:

Instrument used for comparison measurement:

| No. | Target Value Test Load | Target Value Phase Shift                      | Comparison Measurement Power Consumption | Comparison Measurement Phase shift | Measurement Cycle 1 Power Consumption | Measurement Cycle 2 Power Consumption | Measurement Cycle 3 Power Consumption | Mean Value Power Consumption | Mean Deviation Power Consumption compared to Comparison Measurement |
|-----|------------------------|---|--|------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------------|---|
|     | [watts]                | [ - ]   | [watts]                                  | $\cos \varphi =$                   | [watts]                               | [watts]                               | [watts]                               | [watts]                      | [%]   |
| 1   | 3,000                  | $\cos \varphi = 1$                            |  |                                    |                                       |                                       |                                       |                              |   |
| 2   | 1,000                  | $\cos \varphi = 0.92$                         |  |                                    |                                       |                                       |                                       |                              |   |
| 3   | 300                    | $\cos \varphi = 0.86$                         |  |                                    |                                       |                                       |                                       |                              |   |
| 4   | 100                    | $\cos \varphi = 1$                            |  |                                    |                                       |                                       |                                       |                              |   |
| 5   | 30                     | $\cos \varphi = 1$                            |  |                                    |                                       |                                       |                                       |                              |   |
| 6   | 6                      | Acc. to test setup for switching power supply |  |                                    |                                       |                                       |                                       |                              |   |
| 7   | 3                      |   |  |                                    |                                       |                                       |                                       |                              |   |
| 8   | 1                      |   |  |                                    |                                       |                                       |                                       |                              |   |

## 4.2 Energy Consumption Measurement Report

Instrument used for Comparison Measurement:

| Target Value<br>Test Load | Target Value<br>Phase Shift | Measurement Period | Measurement<br>Device under test<br>Energy Consumption | Comparison<br>Measurement<br>Energy Consumption | Deviation<br>compared to<br>Comparison<br>Measurement |
|---------------------------|-----------------------------|--------------------|--|---|---|
| [watts]                   | [ - ]                       | [min]              | [Wh]   | [Wh]  | [%]   |
| 2,300                     | $\cos \varphi = 1$          | 15.0               |  |   |   |

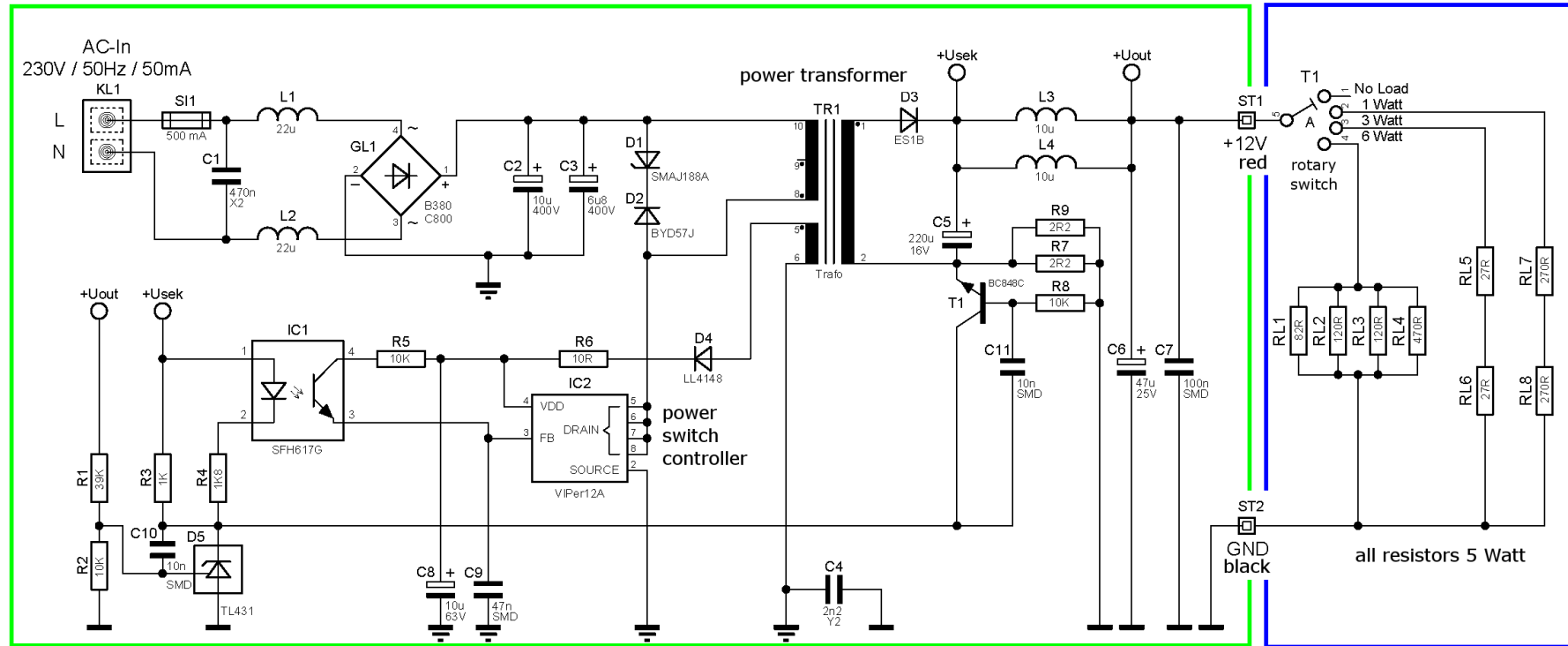
Measurement was performed by:  
Address of the Testing Laboratory:

Place:

Date:

(Signature and Company Stamp  
of the Testing Laboratory)

## 5 Test Setup for Switching Power Supply



green: AC-DC inverter - basic circuit

Complete unit SPS12-UP (ELV-Nr.: 68-626-79)

Two-core power cable (ELV-Nr.: 68-194-25)

blue: Power switching

T1: switch - four-pole (ELV-Nr.: 68-011-24)

RL1: resistor 82 Ohm / 5W (ELV-Nr.: 68-059-59)

RL2, RL3: resistor 120 Ohm / 5W (ELV-Nr.: 68-059-25)

RL4: resistor 470 Ohm / 5W (ELV-Nr.: 68-059-48)

RL5, RL6: resistor 27 Ohm/5W (ELV-Nr.: 68-059-40)

RL7, RL8: resistor 270 Ohm/5W (ELV-Nr.: 68-059-39)

|  |            |                      |
|--|------------|----------------------|
| Projekt: Schaltnetzteil SPS12-UP 1-6W Last |            | Part No.: P0000000   |
|  | Datum      | Layouter: Grob./Mey. |
| gezeichnet                                 | 06.11.2009 | Leiter: Busboom      |
| geprüft                                    |            | PCB: 0522589B1       |
| SCH: Schematic1_1-6Watt                    |            | Project No. XXXX     |
|  |            | Blatt 01             |

11:48:08

Note: The switching power supply (green) may be either assembled as a prototype by use of individual components or purchased as a complete unit from an electronics mail order company [www.elv.de](http://www.elv.de). Power switching (blue) shall be self-constructed in any case.