

BLUE ANGEL

The German Ecolabel



Household Energy Meters

DE-UZ 142

Basic Award Criteria

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Version 1

The Environmental Label is supported by the following four institutions:



The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection 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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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, Nuclear Safety and Consumer Protection, 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

In order to efficiently save energy, it is essential to have an overview of how much energy is being consumed by the different devices or appliances in a household. Users are not usually able to tell how much energy a device or appliance is using in its different operating modes (operation, standby and OFF) and whether the OFF mode is a standby mode or completely disconnects the device or appliance from the mains power. Energy meters enable consumers to measure/determine the power usage (W_{el}), energy consumption (kWh) and related annual energy costs of electric household devices or appliances in all operating modes.

These meters (also called energy cost meters) are installed between the plug on the device or appliance being measured and the socket. When using these meters in households, a differentiation is made between traditional energy meters and smart (networked) energy meters.

Traditional energy meters measure the energy consumption of a device or appliance at a particular socket and directly show the consumption data on a display integrated into the meter. In a standard usage scenario, one energy meter is used in each household to measure the energy consumption of the various devices or appliances in sequence over a short or long period of time. This allows the user to easily identify energy guzzlers so that they can independently take targeted measures to reduce energy consumption.

Smart (networked) energy meters continuously record consumption data and display detailed information for the relevant device or appliance via an interface. In a smart home environment, either one or more smart intermediate plugs can be used depending on the individual requirements and usage scenarios. This decision is dependent on various factors, such as the number of devices or appliances the user wants to control, the spatial distribution of the devices or appliances and the desired automation functions. Users can use an app to check the operating status of the devices or appliances while away from home and switch them off remotely if desired. Predefined scenarios can also be used to save electricity. Specific periods of use can be set for devices or appliances with high power consumption and high standby consumption so that they are automatically disconnected from the power supply at night or during the day when the user is not present.

Alongside the various benefits of energy meters when it comes to saving energy, networking energy meters can cause certain dependencies (see below), which can have a negative effect on the service life of smart meters. This reduced service life can have an environmental impact in the form of increased waste and greater use of raw materials for a product group that was originally intended to save energy and thus reduce the impact on the environment.

One important issue is the product's own software. The energy meter can quickly become unusable if the manufacturer does not provide proper support for the software. It is thus extremely important for manufacturers to provide long-term software support.

If the meter is not compatible with different devices or appliances from various manufacturers and product systems, this will also reduce its service life. Compatibility is thus a key aspect for the product group of smart devices. The ability to easily combine various different devices or appliances with one another is hugely important for the efficiency and user friendliness of the energy meter and should be a decisive factor in the purchasing decision.

In order to consider a smart energy meter sustainable, therefore, it must not only save energy but also have the longest possible service life, which can be achieved by providing software updates over many years and ensuring it communicates with other devices using open standards or those developed for use with products from a broad range of different suppliers.

1.3 Objectives of the Environmental Label

Reducing energy consumption, minimising standby power losses and the responsible use of resources are important goals of environmental protection. On the one hand, the ecolabel for household energy meters informs consumers that the certified product group can help them in their efforts to save energy. On the other hand, the ecolabel informs users which energy meters are particularly suitable for detecting standby losses and identifying those devices or appliances that consume a lot of energy.

The ecolabel can also certify those smart (networked) energy meters that are provided with long-term support and are compatible with various products and product systems so that they have a long service life.

The Blue Angel ecolabel 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 materials that are low in pollutants
- Good documentation of the product properties

For smart devices:

- Data protection and data economy
- Long-term software support and interoperability for use with several different product systems

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

Traditional energy meters:

- High measuring accuracy
- Energy efficient

Smart energy meters:

- High measuring accuracy and energy efficiency
- Multi-compatible
- At least 5 years of software support

1.4 Definitions

Electrical energy consumption: Electrical energy consumption refers to the amount of electrical energy that is consumed by a device or system over a certain period of time. Electrical energy is measured in watt seconds [Ws] or kilowatt hours [kWh] and can be calculated by multiplying the electrical power (P) by the elapsed time (t);

Electrical power: The electrical power (in short: power) (P) is the usable power in an electrical system that can actually be converted into another form of energy, such as thermal, mechanical or radiant energy. Power is measured in watts [Wel] and is an important factor for evaluating the efficiency of electrical and electronic devices or appliances;

Network: A network is a communication infrastructure with a connection topology and architecture that comprises the physical components, organisational principles and communication processes and formats (protocols);

Network availability: The ability of an electrical device to activate functions after it has received a remote trigger signal at a network interface.

Smart (networked) device: An electronic device that can be connected to a network via one of its network interfaces (if switched on).

2 Scope

These Basic Award Criteria apply to energy meters intended for use by the end user on electric mains-operated devices or appliances (230 V_{AC}, 50 Hz). The energy meters must be designed so that they can be placed into operation and used without complex installation work. For this purpose, the devices must be equipped with an earthed safety plug and an earthed safety socket, which may be compactly housed in a casing. The energy meters must have their own display or another suitable and standardised interface separate from the meter on which the respective measurement values can be read.

3 Requirements

3.1 Requirements for all devices

3.1.1 Scope of functions and measuring accuracies

The energy meters must have at least the following functions:

- Measurement and provision of the measurement values for electrical active power [Wel]
- Measurement and provision of the measurement values for electrical energy consumption [kWh]
- Calculation and provision of the energy costs

- Long-term storage of the last measured accumulated values for at least 2 weeks after disconnecting the meter from the mains or an interface for saving the data to a data medium.

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

- A measurement range for power values of at least 0.5 to 3680 watts
- A measuring accuracy for each measured value of $\pm 5\%$. The measurement value may deviate by ± 0.25 watts (for measurement ranges up to 2 watts) or ± 0.5 watts for measurement ranges > 2 watts).

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

- Tolerance of the measured energy consumption of $\pm 5\%$
- Display (using the number of decimal points suitable for the measuring accuracy) for optionally extrapolating the annual energy consumption [kWh/a] from the measured energy consumption or a detailed description in the product documentation of how to calculate the annual energy consumption

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

- Ability for the user to set the energy price
- Factory setting of an energy price that is plausible for household customers at the time of delivery in the delivery country
- Display of the energy costs for the current measurement
- Display for optionally extrapolating the annual energy costs from the current measurement or a detailed description in the product documentation of how to calculate the annual energy costs

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1 and submit a measurement report for the required measurement ranges and tolerances from an independent testing laboratory accredited for these types of measurements in accordance with DIN EN ISO/EC 17025. The testing laboratory shall carry out the testing in accordance with the measurement instructions provided in the appendix and prepare the measurement report using the attached template.

In addition, the applicant shall submit the corresponding pages of the product documentation in which the requirements are documented.

3.1.2 Own power consumption

The power consumption of the energy meters must not exceed the stated power consumption values for each type of device (measured over an interval of 24 hours). The following table provides an overview of the maximum permissible power consumption values for each type of energy meter.

Table 1: Maximum power consumption values for different energy meters

Device type	Maximum power consumption	
Traditional energy meters	1.2 watts	
Smart energy meters	Standby mode	Operating mode
	1 watt	2 watts

Exemption: Multi-plug devices with an energy meter function do not have to comply with the limits stated in Table 1.

Compliance verification

The applicant shall declare compliance with the requirements, state the own power consumption and submit a measurement report from an independent testing laboratory in accordance with Appendix B.

In addition, the applicant shall submit the corresponding pages of the product documentation in which the requirement is documented.

3.1.3 Safety requirements and material requirements for electrical components

The energy meter must carry the CE mark and thus comply with the following European directives:

- 2014/35/EU Low Voltage Directive
- 2014/30/EU Directive on electromagnetic compatibility
- 2011/65/EU Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive)
- 2014/53/EU Radio Equipment Directive

Furthermore, the applicant must produce the following verification of the electrical safety of the energy meters:

- Warming under maximum load in accordance with DIN VDE 0620-2-1 (VDE 0620-2-1):2021-02. The devices must be operated over a test period of 1 hour using a test current of 20 A. The surface temperature and deformability of the housing must be determined. The devices must meet the requirements of the standard.
- Measurement of the surface voltage in accordance with DIN EN 61010 1:2020-03. Any voltage transferred from the live parts to the touchable surfaces must be checked. The devices must meet the requirements of the standard.
- Drop test in accordance with DIN VDE 0620-2-1 (VDE 0620-2-1):2021-02. The devices must be subjected to a drop test and the damage assessed by an expert. The devices must meet the requirements of the standard.¹

Compliance verification

The applicant shall submit the EU Declarations of Conformity confirming compliance with the above-mentioned European Directives. To verify compliance with the above-mentioned requirements for electrical safety, the applicant shall declare compliance with the requirements and

¹ The pins on the plug should be excluded from the assessment.

submit test reports from a testing laboratory accredited in accordance with DIN EN ISO/IEC 17025. The test reports must verify compliance with the requirements.

3.1.4 Requirements for batteries

If the device uses a battery, it must be easy for the user to replace, i.e. without the use of a tool or with the aid of a basic tool (class A according to EN 45554 § A4.4). The battery type must be stated.

Compliance verification

The applicant shall declare compliance with the requirement, state the type of battery in the device if one is used and submit the corresponding pages of the product documentation verifying that the battery is easy to replace.

3.1.5 Substance requirements for plastics used in the housing

The plastics used in the housing and housing parts may not contain any substances with the following properties (which are added to the product as such or as part of a mixture and remain there unchanged in order to achieve or influence certain product properties):

- a) Substances which are identified as particularly alarming under the European Chemicals Regulation REACH (1907/2006/EC) and which have been incorporated into the list drawn up in accordance with Article 59, Paragraph 1 of the REACH Regulation (so-called "list of candidates").²
- b) Substances that according to the CLP Regulation have been classified in the following hazard categories or which meet the criteria for such classification:
 - ◆ carcinogenic in categories Carc. 1A or Carc. 1B
 - ◆ germ cell mutagenic in categories Muta. 1A or Muta. 1B
 - ◆ reprotoxic (teratogenic) in categories Repr. 1A or Repr. 1B

Halogenated polymers are not permitted in the housing and housing parts. Neither may halogenated organic compounds be added as flame retardants. In addition, no flame retardants classified according to the CLP Regulation as carcinogenic in category Carc. 2 (H 351) or as hazardous to water in category Aquatic Chronic 1 (H 410) may be added to the product.

The hazard statements (H Phrases) that correspond to the hazard categories can be found in Appendix C.

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1 to the contract and submit a written declaration from the plastics manufacturer or guarantee the provision of these documents to RAL gGmbH. The declaration shall confirm that the excluded substances have not been added to the plastics and provide a chemical description of the flame-retardant materials

² List of candidates from the REACH Regulation (EC) No. 1907/2006: <https://www.echa.europa.eu/de/candidate-list-table>. The version of the list of candidates at the time of application is valid. If a plastic is newly added to the list of candidates during the term of the Basic Award Criteria and the plastic supplier is obligated to inform the label holder of this fact (Article 33 REACH), the label holder must submit an informal notification stating the name of the substance and its CAS or EC number, as well as information on how the label holder plans to substitute this plastic.

used including the CAS number and its rating (H Phrases) (Annex P-M to the contract). When first applying for the Blue Angel environmental label, the submitted declaration must not be older than 6 months. If one applicant submits additional applications for the labelling of products that contain the same plastics, the submitted declarations may be presented unchanged during the term of the Basic Award Criteria. Notwithstanding this, RAL shall be entitled to ask for an updated version of the declarations if the German Environment Agency (Umweltbundesamt) finds that product-relevant substances have been added to the list of candidates.

3.1.6 Information for consumers

The product documentation is extremely important because energy meters can only provide the desired information and thus help to save electrical energy if they are used in their intended manner.

- a) The product documentation must provide information on how to operate the device in its various operating modes.
- b) The product documentation must document the compliance verifications for the requirements described above that refer to the product documentation (e.g. measuring range, measuring accuracy, own power consumption and type of device battery).
- c) If the energy meter does not have a display for extrapolating the annual energy consumption and annual energy costs according to Paragraph 3.1.1, the product documentation must contain a detailed and understandable explanation of the necessary calculations for consumers. For example, this could take the following form:

- Daily energy costs [euros per day] =

$$\text{Measured value [euros]} / \text{Test period [hours]} * 24 \text{ hours}$$
- Annual energy costs [euros per year] =

$$\text{Daily energy costs [euros per day]} * 365 \text{ days}$$
- Daily energy consumption [kWh per day] =

$$\text{Measured value [kWh]} / \text{Test period [hours]} * 24 \text{ hours}$$
- Annual energy consumption [kWh per year] =

$$\text{Daily energy consumption [kWh per day]} * 365 \text{ days}$$

- d) In order to ensure that the consumer information is easy to read (font size, spacing, etc.), compliance with DIN EN 82079 is recommended.
- e) Furthermore, the Blue Angel recommends that the product documentation should include an example table providing the following information in order to make it easier for the user to carry out the energy consumption measurements:

Electrical device or appliance	Power input [W]	Energy consumption [kWh] or [Wh]	Operating time	Costs [€/kWh]	Annual energy costs [€]

Compliance verification

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

3.2 Additional requirements for smart energy meters

3.2.1 Range of functions

Alongside the functions stated in Paragraph 3.1.1, smart energy meters must also have at least the following functions:

- The ability to switch connected devices or appliances on or off, optionally with remote access for when away from home.
- The user must be able to control the connected devices or appliances and measure their energy consumption using all operating systems commonly used on mobile end devices (at least IOS and Android) via an app or using a browser.

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1. In addition, the applicant shall submit the corresponding pages of the product documentation or provide a link to the manufacturer's website where the requirements are documented. The applicant shall state the operating systems³, apps and browsers, as well as the Internet address on which they run.

3.2.2 Interoperability

The device should communicate using open standards or standards and interfaces used by a large number of different suppliers.

Users should be able to easily find information on those smart home systems that are compatible with the device.

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1 and submit the corresponding pages of the product documentation or a corresponding link to the manufacturer's website on which the compatible systems are listed.

3.2.3 Software updates

The energy meters should be supported by the applicant for as long as possible. To this end, the applicant undertakes to guarantee the provision of security and function updates for at least 5 years after the last unit of the relevant model is placed on the market. These updates must be provided free of charge.

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1 to the contract, mark the corresponding sections of the product documentation in which the security and function updates are described and submit the relevant pages of the product documentation as Annex x to the contract.

³ The German Environment Agency may add other operating systems. All applicants must fulfil the compatibility requirements from the time that a new operating system is added.

3.2.4 Data economy and fundamental purpose of the data

It must be possible for the energy meter to be used for the purpose of monitoring energy consumption on a standard local network, without having to connect to a wide area network (e.g. the Internet). If the manufacturer themselves or a third party provides value added services online (e.g. for evaluating or presenting the energy data from the energy meters), these services must also comply with the regulations in the EU General Data Protection Regulation. In particular, these value added services may only process data with the informed consent of the user and the scope of this data processing must be limited to fulfilling the purpose of the added value service.

In accordance with the principle of purpose limitation, personal data may only be used for the purpose for which it was originally collected. Any use of the personal data for another purpose, e.g. for marketing purposes, is prohibited.

Compliance verification

The applicant shall declare compliance with the requirements, mark the corresponding sections of the privacy policy (or data protection statement) and submit it as Annex x to the contract.

3.2.5 Transparent collection of data

Users must be informed about the type, scope and purpose of the data transmitted over the network in accordance with the General Data Protection Regulation (GDPR). This information can be provided in the product documentation or in an easy to find place on the manufacturer's website. The Blue Angel recommends that the information on data protection is written in such a way that it can be understood by people with all levels of knowledge.

Compliance verification

The applicant shall declare compliance with the GDPR, mark the sections of the product documentation in which the information on data collection can be found and submit these sections or a link to the corresponding website as Annex x to the contract.

3.2.6 Security

The energy meter must comply with the basic security requirements in the European standard DIN EN 303645: "CYBER - Cyber Security for Consumer Internet of Things". Personal data must be transmitted within the household and also to external bodies using state-of-the-art encrypted connections.

Compliance verification

The applicant shall declare compliance with the requirements in Annex 1. In order to verify compliance with DIN EN 303 645, the applicant shall submit an evaluation report form a testing institution as Annex x.

3.2.7 Electromagnetic radiation

Smart energy meters must be low power devices according to the conditions in EN 50663 or EN 62479. In addition, the following information must be provided:

- Information on the peak radiated transmission power of the radio interface
- Information on the average radiated transmission power of the radio interface over a period of 6 minutes

Compliance verification

The applicant shall verify compliance with the requirements by submitting a test report according to EN 50663 or an EMF evaluation report according to EN 62479 from a testing laboratory accredited according to DIN EN ISO/IEC 17025, which satisfy the criteria in the respective standard (e.g. providing all information necessary for the completion of repeatable evaluations, tests, calculations or measurements) and can be used to determine the transmission frequencies and also the following values for the respective device:

- 1. Highest peak radiated transmission power*
- 2. Highest average radiated transmission power over a period of 6 minutes*

Note: If the test report includes a value for the highest peak radiated transmission power and a maximum duty cycle over a period of 6 minutes, the highest average radiated transmission power over a period of 6 minutes can be determined by multiplying both values with one another.

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, 2028.

They shall be extended by periods of one year each, unless terminated in writing by March 31, 2028 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.

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Appendix A Cited legislations and standards, literature

- CLP Regulation: 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, as well as amending Regulation (EC) No. 1907/2006, Version 17/12/2022
- DIN EN 303645 (2021-02): CYBER - Cyber Security for Consumer Internet of Things: Baseline Requirements
- DIN EN 50663 (2019-04): Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz)
- DIN EN 61010-1 (2020-03): Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- DIN EN 62479 (2011-09): Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)
- DIN EN 82079 (2021-09): Preparation of information for use (instructions for use) of products - Part 1: Principles and general requirements
- DIN EN ISO/IEC 17025 (2018-03): General requirements for the competence of testing and calibration laboratories
- DIN VDE 0620-2-1 (2021-02): Plugs and socket-outlets for household and similar purposes - Part 2-1: General requirements on Plugs and portable socket-outlets
- REACH regulation: Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, from 17/12/2022
- Directive 2011/65/EC of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive)
- Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive)
- Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits. (Low Voltage Directive)
- Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (Radio Equipment Directive)

Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation)

Appendix B Instructions for the active power and energy consumption measurements

1 Preface

According to Paragraph 3.1 of the Basic Award Criteria for "Household Energy Meters" (DE-UZ 142), the applicant must verify that the energy meter complies with the required measuring accuracy by submitting a measurement report.

These instructions provide a detailed description of the individual measurements to be carried out. In addition to the measurement instructions described here, the test report must be completed by a testing laboratory that fulfils the requirements for the competence of testing and calibration laboratories according to DIN EN ISO/IEC 17025.

2 Setup for the active power measurement

The setup for the active power measurement consists of a constant AC voltage supply of $230\text{ V} \pm 1\%$ at $50\text{ Hz} \pm 1\%$, the energy meter being tested and the defined test loads listed in the following table. The loads represent typical electrical energy consumers in private households, some of which with phase shifts and harmonics.

Measurements 6 to 8 must be carried out using the test setup described in section 5 for a switching power supply.

Test loads for one measurement cycle:

Number	Target value of test load	Target value of phase shift
	[watts]	[-]
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.	6.8	Acc. to test setup for a switching power supply
7.	3.1	Acc. to test setup for a switching power supply
8.	1.0	Acc. to test setup for a switching power supply

The measurements should be carried out by connecting up the AC voltage supply, energy meter and defined test load and then reading the active power displayed on the energy meter after about 1 minute. The measurements must be carried out as a measurement cycle in the given order (measurements 1 to 8). The measurement cycle must be repeated three times. Then calculate the arithmetic mean from the 3 measured values for each measurement number and record it in the measurement report in section 4.

Use a calibrated laboratory instrument to take comparative measurements of the active power and phase shift for the same loads as $\cos \varphi$ values and record them in the measurement report in section 4.

3 Setup for the energy consumption measurement

The test setup for determining the tolerance of the energy consumption measurement consists of a constant AC voltage supply of 230 V \pm 1% at 50 Hz \pm 1%, the energy meter being tested and a defined test load drawing a constant current of 10 A without phase shift ($\cos \varphi = 1$).

Measure the energy consumption [Wh] using the test device over a set period of time (defined by the testing laboratory) and record the energy consumption values before and after the measurement. Record the defined time period and deviation in the measurements in the measurement report in section 4.1.

For the comparative measurement, replace the device being tested with a calibrated laboratory instrument and repeat the measurement. The deviation should also be documented in the measurement report in section 4.2.

4 Measurement report

4.1 Measurement report for the active power measurement

Type designation of the device being tested:

Laboratory instrument used for the comparative measurement:

No.	Target value of test load	Target value of phase shift	Comparative active power measurement	Comparative phase shift measurement	Measurement cycle 1 active power value	Measurement cycle 2 active power value	Measurement cycle 3 active power value	Mean active power value	Mean deviation between active power value and comparative measurement
	[watts]	[-]	[watts]	cos φ =	[watts]	[watts]	[watts]	[watts]	[%]
1.	3,000	cos φ = 1							
2.	1,000	cos φ = 0.92							
3.	300	cos φ = 0.86							
4.	100	cos φ = 1							
5.	30	cos φ = 1							
6.	6.8	Acc. to test setup for a switching power supply							
7.	3.1	Acc. to test setup for a switching power supply							
8.	1.0	Acc. to test setup for a switching power supply							

4.2 Measurement report for the energy consumption measurement

Laboratory instrument used for the comparative measurement:

Target value of test load	Target value of phase shift	Measurement period	Energy consumption measurement for device being tested	Comparative energy consumption measurement	Deviation to comparative measurement
[watts]	[-]	[min]	[Wh]	[Wh]	[%]
2,300	$\cos \varphi = 1$				

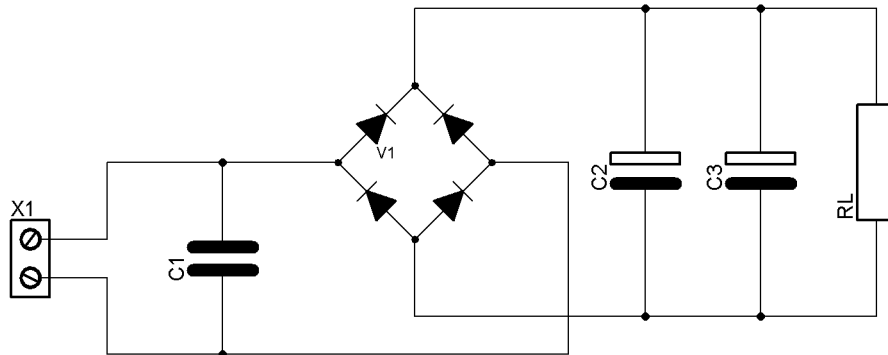
Measurement performed by:

Address of testing laboratory:

Location:

Date: (Signature and company stamp of testing laboratory)

5 Test setup for a switching power supply



Test setup as test load for measurements 6 to 8

Parts list

- C1 470 nF, 10 %, X2
- C2 10 μ F, 10 %, 400 V
- C3 10 μ F, 10 %, 400 V
- RL For measurement 6: 15 k Ω , 5 %
For measurement 7: 33 k Ω , 5 %
For measurement 8: 100 k Ω , 5 %
- V1 Bridge rectifier 380 V, 800 mA
- X1 Connection terminal for AC power supply 230 V, 50 Hz

Note: The resistance values were selected from the readily available E12 series.

Appendix C Assignment of hazard categories and H Phrases

The following table assigns the hazard categories for the general exclusion of substances to the corresponding hazard statements (H Phrases).

CLP Regulation (EC) No. 1272/2008		
Hazard categories	Hazard statements	
	H Phrases	Wording
Carcinogenic substances		
Carc. 1A Carc. 1B	H350	May cause cancer.
Carc. 1A Carc. 1B	H350i	May cause cancer if inhaled.
Germ cell mutagenic substances		
Muta. 1A Muta. 1B	H340	May cause genetic defects.
Reprotoxic substances		
Repr. 1A Repr. 1B	H360D	May damage the unborn child.
Repr. 1A Repr. 1B	H360F	May damage fertility.
Repr. 1A Repr. 1B	H360FD	May damage fertility. May damage the unborn child.
Repr. 1A Repr. 1B	H360Df	May damage the unborn child. Suspected of damaging fertility.
Repr. 1A Repr. 1B	H360Fd	May damage fertility. Suspected of damaging the unborn child.
Environmental hazards		
Aquatic Chronic 1	H410	Very toxic to aquatic life with long-lasting effects.