

# **BLUE ANGEL**

**The German Ecolabel**



## **Solar-Powered Products**

**DE-UZ 116**

**Basic Award Criteria**

**Edition May 2012**

**Version 7**

## 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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**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

Solar technology offers a major opportunity to secure future energy supplies. Solar technology may be effectively used in energy-consuming products if, for example, this reduces the use of primary batteries or makes a connection to the power grid superfluous. Often, photovoltaic energy supply is provided by a system of rechargeable batteries to guarantee sufficient functional safety of the product. As they need no cadmium-containing batteries, photovoltaic products can help reduce environmental impacts and make power generation by solar cells more popular.

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



## 1.3 Definitions

„Accumulators“ within the meaning of these Basic Criteria are rechargeable batteries.

„Batteries“ within the meaning of these Basic Criteria meet the definition under Section 2 of the German Batteriegelgesetz (BattG) (Batteries Act).<sup>1</sup>

# 2 Scope

These Basic Criteria apply to solar-powered products for indoor and outdoor use according to the following paragraphs<sup>2</sup>

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<sup>1</sup> "Battery" means any source of electrical energy generated by direct conversion of chemical energy and consisting of one or more non-rechargeable primary battery cells or consisting of rechargeable secondary battery cells. (Section 2, BattG).

<sup>2</sup> Graphic diagram, see Appendix 1

- a) Solar-powered products without battery, e.g. watches, calipers, desktop and handheld calculators, titrators, solar experimental kits,
- b) Solar-powered indoor products with accumulator, e.g. milk frothers, illuminated photo frames, wireless keyboards, data recording and data display devices
- c) other solar-powered products (outdoor and varying fields of use), e.g. electric fence energisers, house number lights, gate operators, rolling shutters, garden lights, grave lights, garden equipment, torches, portable IT and communication devices, solar chargers.

A product within the meaning of these Basic Criteria is a complete system including solar module, charging electronics and electrical consumer and/or energy storage medium (accumulator, capacitor, etc.)<sup>3</sup>.

**Starting from January 1st, 2027 these award criteria apply to solar-powered products for indoor use in accordance with section:**

- 3.1 Solar-powered products without batteries, e.g. wristwatches, callipers, desktop and pocket calculators, titration devices, solar experiment kits,

A product within the meaning of these award criteria is a complete system with a solar module, charging electronics, electrical consumer and, if applicable, a storage medium in the form of a capacitor.

Sections 3.2 and 3.3 of these award criteria are no longer valid.

### 3 Requirements

The Blue Angel eco-label may be awarded to solar products listed under "Scope", provided that they meet the following requirements.

#### 3.1 Solar-Powered Products Without Battery

Solar-powered products without battery shall perform at full capacity at the light quantities and dark power reserve levels or illuminance or irradiance levels listed in the table below:

Product	Full Capacity at a minimum of:
Clocks/Watches	Quantity of light: 2,000 lux h/day
Dark power reserve: 72 h	
Calipers, desktop and handheld calculators	Illuminance: 50 lux
Scales for small-scale applications (letter, parcel, bathroom and kitchen scales)	Illuminance: 150 lux
Titrators	Illuminance: 1,000 lux
Toys, solar kits; solar training and experimental kits	Illuminance 150 W/m <sup>2</sup> or illuminance 18,000 lux

#### Compliance Verification

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract and submit specifications of the respective light quantities and dark power reserve levels or illuminance and irradiation levels using the form pursuant to Annex 7a.*

<sup>3</sup> As regards solar chargers, systems without proper accumulator (storage medium) shall also be considered as products within the meaning of these Basic Criteria (requirements according to para. 3.3.1 c)).

### 3.2 Solar-Powered Indoor Products with Accumulator

Indoor products are products that are primarily used indoors.

#### 3.2.1 Functional Safety Requirements

Indoor products shall perform at full capacity at the light quantity levels (fluorescent light) and dark power reserve levels listed in the table below:

Place of Use	Product Examples	Quantity of Light/Dark Power Reserve
Cafeteria/kitchen/home environment Location: near the window	Milk frother, illuminated photo frame	20,000 lux h/day 40 days
Office environment	Desktop clock, wireless keyboard	4,000 lux h/day 40 days
Home environment normal light conditions (e.g. living room)	Wall clock, data collection and data display system	2,900 lux h/day 50 days
Home environment limited light conditions (e.g. bedroom)	Solar alarm clock, wrist watch	2,000 lux h/day 60 days

#### Compliance Verification

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract and prove compliance with the functional safety requirement by record-based calculations pursuant to Annex 7b. Such calculations shall take into account the product's technologically relevant design data, such as consumer's power consumption, module data, current/voltage characteristic, spectral sensitivity, temperature coefficient and type, as well as the accumulator data, such as type, capacity, temperature coefficient of capacity and end-of-deep discharge voltage.*

#### 3.2.2 Consumer Information

The applicant shall include the following consumer information into the product description:

- The proper handling during the initial charging of the accumulator or general information on the correct handling for optimum maintenance of accumulator capacity.

#### Compliance Verification

*The applicant shall declare compliance with the requirement in Annex 1 to the Contract and submit the relevant pages of the product literature.*

### 3.3 Other Solar-Powered Products with Accumulator (outdoor and varying fields of use)

This includes both solar-powered products with accumulator which are primarily used outdoors in a stationary position (e.g. electric fence energisers, garden lights, garden equipment) and products for mobile and flexible use (e.g. portable IT and communication devices, torches) as

well as solar chargers (consisting of solar module and charger and, possibly, proper accumulator or other storage medium).

### **3.3.1 Charge time and Functional Safety Requirements**

Solar module and the proper charging electronics shall be so designed as to allow accumulator charging from an irradiance of 50 W/m<sup>2</sup> (functionality at low light).

#### **a) Solar-Powered Products for Stationary Outdoor Use (e.g. electric fence energisers, garage door operators, etc.):**

For use in Germany these products must fully perform the manufacturer-specified functions during the specified period of use and under the specified conditions of use.

##### **Additional Requirements:**

- ♦ The imprint on a solar house number light shall still be clearly visible from a distance of 10 m after a luminous period of 12 hours during darkness (0.25 lux).
- ♦ For use in Germany solar lamps shall meet the manufacturer-specified luminous period – at least, however, four hours per night – during the specified period of use<sup>4</sup>.
- ♦ The product's luminous flux (in lumens) shall be indicated on the packaging.
- ♦ As regards the charge time, the products shall meet the analogous requirements for solar chargers (see below).

#### **b) Solar Chargers as well as Self-Sustaining Solar-Powered Products with Integrated or Proper Accumulators for Mobile Fields of Use,** shall be able – under NOCT conditions and the Measurement Guidelines set forth in the Appendix – to charge the integrated or proper accumulators with an amount of energy within 8 hours that guarantees compliance with the criteria stated under a) for the luminous period.

The manufacturer shall declare that the accumulators that may be replaced according to para. 3.6.1 will be available in an equivalent quality for at least 2 years from end of production of the system.

#### **c) Solar Chargers without Proper Accumulators** shall be able - under NOCT conditions and the Measurement Guidelines set forth in the Appendix – to nearly fully charge the manufacturer-specified accumulators within 8 hours (= 90% of the minimum nominal capacity).

The manufacturer shall name the recommended accumulator with an indication of the recommended nominal capacity in the product description.

### **Compliance Verification**

*The applicant shall declare compliance with the requirements under a), b) or c) in Annex 1 to the Contract. To establish compliance with the low-light functionality requirement the applicant shall present a measurement protocol (Annex 7d) stating that at least 3 percent of the current determined under NOCT conditions flow at the specified irradiance. In addition, the applicant shall establish compliance with the required charge time and functional safety on the basis of measurement protocols according to Appendix 2 using the form of Annex 7c.*

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<sup>4</sup> The lamps must - for a minimum of four hours – generate a luminous flux of at least 50% of the maximum luminous flux or, if used with an electronic dimmer, an average luminous flux of at least 50% of the maximum luminous flux for at least six hours.

For **stationary solar-powered outdoor products under point a)**, the applicant shall **additionally** establish compliance with the functional safety requirement by means of computer-aided simulation results. Simulation shall be performed using a standard software product or by third parties. The weather data for the test reference year for Hamburg shall be used for products available on the country-wide (German) market. The simulation shall take into account the periods of use specified by the manufacturer in the product literature (year-round or, for example, summer only).

Moreover, the applicant shall present as Annex 7e a simulation results protocol specifying the basic input data. The results protocol shall include:

- name of the software used,
- name of the institution that has performed the simulation,
- weather data sets used,
- product specifications

### **3.3.2 Consumer Information**

The applicant shall include the following consumer information into the product description:

- The proper handling during the initial charging of the accumulator or general information on the correct handling for optimum maintenance of accumulator capacity.
- The charge time for full charge (100%) in hours with reference to the nominal capacity of the integrated or proper or recommended accumulator.
- The resulting average charge time for 1 Ah related to the respective accumulator equipment.
- Note stating that the charge time measured has been determined at an irradiance corresponding to 80 percent of the insolation of the summer-time noon sun and that under close-to-reality conditions, especially in winter or on rainy days, one must expect a charge time many times over.
- Note stating that the functional safety may be restricted under unfavourable conditions of use, such as shading, unfavourable orientation or tilt angle of the solar module.

#### **Compliance Verification**

*The applicant shall declare compliance with the requirement in Annex 1 to the Contract and submit the relevant pages of the product literature. The information shall be provided taking into account the Measurement Guidelines for determining the charge time under Appendix 2.*

### **3.4 General Requirements**

A prerequisite for award of the Blue Angel eco-label to products within the "Scope" of these Basic Criteria shall be a Declaration of Conformity with European Community (EC) Directives.

#### **Compliance Verification**

*The applicant shall submit a corresponding Declaration of Conformity as Annex 4.*

### **3.5 Manufacturer's Warranty**

Applicant's product warranty shall cover all units or components of the system (i.e. including solar module). It also covers the performance of all functions listed in the product description for at least two years.

This shall not apply to accumulators (if included) - they shall be covered by a minimum 6-month warranty.

### **Compliance Verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract and submit the relevant excerpts from the product description.*

## **3.6 Requirements for Accumulators**

### **3.6.1 Replaceability of Accumulators**

If the system uses an accumulator it must in any case be possible to replace it.

If the accumulator is to be replaced by the user itself it shall be installed so as to allow the user to replace the accumulator by use of ordinary tools. The product description shall include a step-by-step description of the replacement process.

If the system uses an accumulator that needs to be replaced by a specialist the product description shall provide information on appropriate service providers.

### **Compliance Verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract and submit relevant excerpts from the product description.*

### **3.6.2 Ban on Cadmium-Containing Accumulators**

If the systems use an accumulator the applicant shall undertake to only use cadmium-free accumulators according to the Batteriegesetz (BattG) (German Batteries Act) and include a clear notice requiring the use of a cadmium-free replacement accumulator into the product description.

### **Compliance Verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract or present a declaration from the supplier of accumulators as well as relevant excerpts from the product literature.*

### **3.6.3 Safety Measures for Protection of Accumulator and External User Devices**

The following requirements shall be met to protect the accumulator from exceeding and falling below the admissible temperature range, overcharging and deep discharging as well as from over-current:

- Solar module and accumulator shall be thermally separated from each other by design or technical measures.
- Charging electronics shall make sure that the integrated, proper or recommended accumulators or user devices are activated during operation in accordance with the specifications defined by the accumulator or user device manufacturer.

### **Compliance Verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract.*

### **3.6.4 Instructions for Proper Disposal**

The product literature shall include the following instructions in an easy-to-read manner (similar wording will be allowed):

- Batteries shall – as a matter of principle - be taken to a battery collection facility; batteries must not be disposed of with the normal household waste.

Moreover, the product literature shall include – with respect to the entire product – instructions according to the “Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Elektro- und Elektronikgeräten (ElektroG)” (Act on the placing on the market, return and environmentally sound disposal of waste electrical and electronic equipment).

### **Compliance Verification**

*The applicant shall declare compliance with the requirements in Annex 1 to the Contract and submit relevant excerpts from the product description.*

## **3.7 Material Requirements**

### **3.7.1 Material Requirements for Plastics used in Housings and Housing Parts**

The plastics must not contain as constituent parts any substances that are classified as

- a) carcinogenic in categories 1 or 2 according to Table 3.2 or categories 1A and 1B according to Table 3.1 of Annex VI to Regulation (EC) No 1272/2008<sup>5</sup>
- b) mutagenic in categories 1 or 2 according to Table 3.2 or categories 1A and 1B according to Table 3.1 of Annex VI to Regulation (EC) No 1272/2008
- c) reprotoxic in categories 1 or 2 according to Table 3.2 or categories 1A and 1B according to Table 3.1 of Annex VI to Regulation (EC) No 1272/2008
- d) Substances that are identified as particularly alarming under the Chemicals Regulation REACH (1907/2006/EC) and which have been incorporated into the list drawn up in accordance with Article 59 (1) of the REACH Regulation (so-called “list of candidates”, as amended at the time of application<sup>6</sup>.

Halogenated polymers shall not be permitted. Neither may halogenated organic compounds be added as flame retardants. Moreover, no additions of flame retardants may be added which are labelled with Risk Phrase R 50/53 or Hazard Phrase H 410 pursuant to Part 3 of Annex VI to EC Regulation 1272/2008.

The following shall be exempt from this rule:

- plastics used in films covering the back of the solar generator;
- process-related, technically unavoidable impurities;

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<sup>5</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 (short: GHS Regulation). [http://www.reach-info.de/ghs\\_verordnung.htm](http://www.reach-info.de/ghs_verordnung.htm), as amended. Annex VI, Part 3, includes the harmonized classification and labelling of certain hazardous substances. Table 3.1 lists classifications and labelling according to the new system using H Phrases; Table 3.2 lists classifications and labelling according to the old system. (List of harmonized classifications and labelling for hazardous substances in Annex I to Directive 67/548/EWG) using R Phrases.

The GHS Regulation (Globally Harmonized System), that has come into force on January 20, 2009, replaces the old Directives 67/548/EEC (Dangerous Substances Directive) and 1999/45/EC (Dangerous Preparations Directive). According to the said regulation, substances are classified, labelled and packed until December 1, 2010 according to Directive 67/548/EEC while mixtures (formerly preparations) are classified, labelled and packed until June 1, 2015 according to Directive 1999/45/EC. Thereafter, the GHS Regulation shall be applied. The new indications of danger (H Phrases) as well as the hitherto applicable R Phrases (risk phrases) shall be indicated for substances until the 1st of June 2015.

<sup>6</sup> For the list of candidates, as amended, please go to:

[http://echa.europa.eu/chem\\_data/authorisation\\_process/candidate\\_list\\_table\\_en.asp](http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp)

- 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**

*The applicant shall declare compliance with the requirements in Annex 2. As regards the substances to be banned from the plastics for housings and housing parts, the applicant shall request 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 request the manufacturers or suppliers of housing plastics to confidentially report the chemical designation of the flame retardants used (CAS-No.) to RAL gGmbH.*

### **3.7.2 Other Material Requirements**

Neither PBBs (polybrominated biphenyls), nor PBDEs (polybrominated diphenyl ethers), nor chlorinated paraffins may be added to the carrier material of printed circuit boards.

### **Compliance Verification**

*The applicant shall declare compliance with the requirement in Annex 1 to the Contract, the manufacturer of printed circuit boards shall declare compliance with the requirement in Annex 6 to the Contract.*

## **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, 2026. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2026 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.

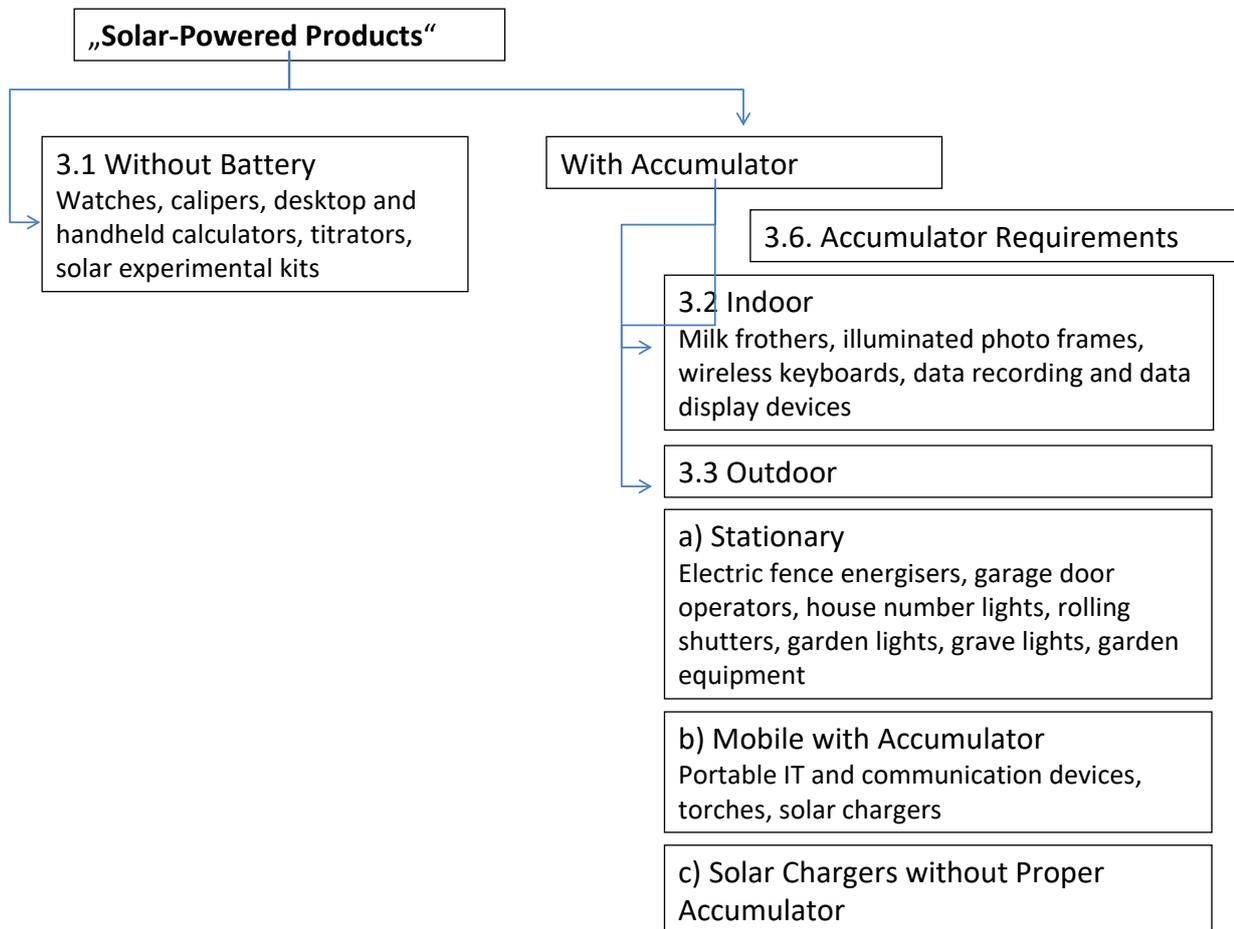
The applicant (manufacturer) shall be entitled to apply to RAL gGmbH for an extension of the right to use the ecolabel on the product entitled to the label if it is to be marketed under another brand/trade name and/or other marketing organisations.

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 Graphic Diagram of the Solar-Powered Products covered by these Basic Criteria**



## **Appendix B Measurement Guidelines for Determining the Charge time and for Verifying Compliance with the Functional Safety Requirement pursuant to paragraph 3.3.1, b) and c)**

The charge time may – as a matter of principle – be measured for the entire system (solar module, charger and rechargeable battery) under NOCT conditions (laboratory simulation measurement).

- a) The NOCT characteristic may serve as a basis for products where solar module and rechargeable battery may be locally separated during charging. It shall be attached to the application documents. Based on the NOCT characteristic, a power value or range is to be assumed which
- ♦ *corresponds to the optimum value in chargers with readjustment of the power drain to the maximum power point (MPP Tracking)*
  - ♦ *corresponds to the value or range of values in chargers without MPP Tracking obtained by the constant applied voltage or the charge voltage range of the battery.*

The charge time can be determined by use of the above-mentioned power values from the NOCT characteristic in a simplified laboratory measurement on a specific power supply unit simulating the I-U characteristic of a photovoltaic module.

The charge time corresponds to the time required to recharge a rechargeable battery from “empty” (end-of-discharge voltage) to “full”.

Two charge times are to be determined:

- almost full charge, i.e. charge to = 90% of the charging capacity specified by the charger manufacturer (for integrated or proper rechargeable batteries) or to = 90% of the nominal capacity of the recommended rechargeable battery (for chargers without integrated or proper rechargeable batteries)
- full charge, i.e. charge to 100% of the charging capacity specified by the charger manufacturer (for integrated or proper rechargeable batteries) or to 100% of the nominal capacity of the recommended rechargeable battery (for chargers without integrated or proper rechargeable batteries).

*Full Charge* is reached, for example, if the charging process and, with it, the measurement is stopped by the charger's electronics. The measurement protocol shall be attached to the application documents.

The measurement protocol shall include the following data:

- NOCT power level or range selected,
- accumulator terminal voltage at the beginning of charging (end-of-discharge voltage),
- accumulator terminal voltage at the end of charging,
- nominal capacity of the rechargeable battery,
- charging capacity specified by the charger manufacturer,
- charge current on an I-t diagram
- as well as the resulting charge times for almost full (= 90%) and full (100%) charge.

The applicant shall document the charge time for almost full charge in the declaration on para. 3.3.1.

The charge time for *full charge* shall be documented in the product description in accordance with para. 3.3.2.

In addition, the applicant shall document the *average charge time* for 1 Ah [h/1Ah] according to para. 3.3.2 using the following formula and indicate the resulting value in the product description:

$$\text{Average charge time for 1 Ah} = \frac{\text{charge time for full charge [h]}}{\text{specified charging or nominal capacity, respectively [Ah]}}$$

- b) The thermal behaviour under NOCT conditions shall be maintained for products whose solar modules and rechargeable battery cannot be locally separated during charging. The temperature of the battery must be adjusted to the temperature under NOCT conditions. The temperature of the battery under NOCT conditions may be determined, for example, by an outdoor measurement.

To be continued as set forth in 1).