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Lead-acid starter batteries - Part 1: General requirements and methods of test

Blei-Akkumulatoren-Starterbatterien - Teil 1: Allgemeine Anforderungen und Prüfungen

Batteries d'accumulateurs de démarrage au plomb - Partie 1: Prescriptions générales et méthodes d'essais

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This draft European Standard is submitted to CENELEC members for CENELEC enquiry. Deadline for CENELEC: 2014-08-21.

It has been drawn up by CLC/TC 21X.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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Foreword

This document (prEN 50342-1:2014*)* has been prepared by CLC/TC 21X "*Secondary cells and batteries*".

This document is currently submitted to the Enquiry.

This document will supersede EN 50342-1:2006.

0 Introduction

0.1 Object

The object of this standard is to specify

- general requirements;
- certain essential functional characteristics, the relevant test methods and results required, for several classes and types of starter batteries.

0.2 Designation of starter batteries

Batteries are classified according to their types

Battery type	Definition
Flooded or vented batteries	a secondary battery having a cover provided with one or more openings through which gaseous products may escape EFB batteries are **e**nhanced vented (**f**looded) secondary **b**atteries, with additional special design features to significantly improve the cycling capability compared to standard flooded batteries. These batteries shall have a water consumption performance level of W3, W4 or W5.
Valve regulated batteries	a secondary battery which is closed under normal conditions but which has an arrangement that allows the escape of gas if the internal pressure exceeds a predetermined value. The battery cannot receive addition to the electrolyte. In Valve Regulated batteries, the electrolyte is immobilized. In case electrolyte is immobilized by absorbing in a glass mat this type of VRLA-battery is called AGM-battery (**A**bsorbent **G**lass **M**at). In case electrolyte is immobilized by fixing as gel this type of VRLA-battery is called GEL- battery

0.3 Condition on delivery

0.3.1 Electrolyte density and open circuit voltage

Electrolyte density and open circuit voltage of lead acid battery are depending on state of charge and temperature.

The density of the electrolyte in all fully charged vented batteries shall be in the range 1,27 kg/l to 1,30 kg/l at 25 °C unless otherwise specified by the manufacturer.

The open circuit voltage (OCV), of fully charged batteries after a minimum of 24 h stand on open circuit, shall be in the range 12,70 V to 12,90 V for vented types and 12,80 V to 13,00 V for valve regulated types at 25 °C unless otherwise specified by the manufacturer.

0.3.2 Definition of fully charged new battery

New vented batteries may be supplied

- either in a state ready for use, filled with the appropriate electrolyte to the maximum level. 24h after an initial charge (according to 5.2), the electrolyte density or OCV shall be within the ranges specified in 0.3.1.In batteries with lid without plugs checking electrolyte density is generally not possible. In this cases OCV is to check only according 0.3.1.

- or dry charged as defined in chapter 7.

Valve regulated batteries are normally supplied in a state ready for use. 24 h after an initial charge (according to 5.2) OCV shall be within ranges specified in 0.3.1. For these batteries the electrolyte is not accessible and therefore its density cannot be checked.

1 Scope

This standard is applicable to lead-acid batteries with a nominal voltage of 12 V, used primarily as a power source for the starting of internal combustion engines, lighting and also for auxiliary equipment of internal combustion engine vehicles. These batteries are commonly called “starter batteries”. Batteries with a nominal voltage of 6 V are also included within the scope of this standard. All referenced voltages have to be divided by two for 6 V batteries.

This standard is applicable to batteries for the following purposes:

- batteries for passenger cars,
- batteries for commercial and industrial vehicles.

This standard is not applicable to batteries for other purposes, for example the starting of railcar internal combustion engines or for motorcycles.

NOTE Separate standard for motorcycle batteries is under preparation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50342–2:2001, Lead-acid starter batteries. Part 2: Dimensions of batteries and dimensions and marking of terminals

EN 50342–4:2009, Lead-acid starter batteries. Part 4. Dimensions of batteries for heavy commercial vehicles

EN 61429:1996/A11:1998, Marking of secondary cells and batteries with the international recycling symbol ISO 7000-1135 and indications regarding directives 93/86/EEC and 91/157/EEC

IEC 60050–482:2004, International Electrotechnical Vocabulary. Part 482: Primary and secondary cells and batteries

ECE 37, UN/ECE Regulation ECE 37, Agreement Concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions, Regulation No. 37: Uniform provisions concerning the approval of filament lamps for use in approved lamp units of power-driven vehicles and of their trailers.

3 General requirements

3.1 Identification, labelling

Batteries according to this standard shall bear the following characteristics on at least one of their sides or on the top surface:

a) the identification of manufacturer or supplier;

b) the nominal voltage, i.e. 12 V or 6 V;

c) Obligatory: nominal capacity C20 (Ah) (see 4.1.2),

The values of C20 for all batteries shall correspond to the electrolyte density or OCV given in section 0.3.1;

d) Obligatory: the nominal cranking current I_{cc} (see 4.1.1);

e) the six coloured symbols as specified in Annex A, Safety labelling;

f) the marking for the separate collection and recycling according to EN 61429;

g) valve regulated batteries shall be marked ‘VRLA'.

h) Label size: The capacity C20 and the cold cranking current I_{cc} (A) shall be displayed on a separate label or as text on a combined label (e.g. together with additional information of the producer or type mark). The size of the label shall be at least 3 % of the largest side of the battery. The character size high should be at least 3 mm. The label must be fixed on one of the four sides or on the lid. A multiple labelling is allowed.

i) Batteries for micro-hybrid application shall be specifically identified

NOTE Separate standard is under preparation

j) Date of production (this could be a part of more complex code too)

k) Requirement levels according to water consumption, charge retention, endurance and vibration as specified in Appendix C

NOTE Batteries may be marked with other information such as the filling and charging date

3.2 Marking of the polarity

This shall be in accordance with:

EN 50342-2, Part 2: Dimensions of batteries and dimensions and marking of terminals

EN 50342-4, Part 4: Dimensions of batteries for heavy commercial vehicles

4 Functional characteristics

For general definitions of terms see Part 482 of the International Electro-technical Vocabulary (IEV) (IEC 60050-482).

4.1 Electrical characteristics

4.1.1 The *cranking current* is the discharge current i_{cc} to be indicated by the manufacturer which a battery can supply at –18°C for 10 s to a minimum voltage U_f = 7,50 V and complying with requirements of a simulated cranking profile according 6.2. It is used as well to check the high current discharge performance according 6.3

4.1.2 The *capacity* of a starter battery is defined for the temperature of 25 °C ± 2 °C. The nominal capacity C_n in this standard is a C20. It has to be indicated by the manufacturer as nominal 20h capacity C20 (Ah).

The *nominal 20 h capacity* C_n is the electric charge (in Ah) that a battery can supply with a current:

$$I_n = \frac{C_n}{20} \quad \text{(A)}$$

to a final voltage U_f = 10,50 V.

The *effective capacity* C_e shall be determined by discharging a battery with constant current I_n to U_f = 10,50 V (see 6.1).

4.1.3 The *charge acceptance* is expressed as the current I_{ca} which a partially discharged battery accepts at 0 °C and a constant voltage of 14,40 V (see 6.3).

4.1.4 *Charge retention* is measured by the high current discharge performance of the charged and filled battery after storage on open circuit under defined conditions of temperature and time (see 6.4).

4.1.5 The *endurance* tests consist of cycling and a deep discharge part.

The Cycling test represents the ability of a battery to perform repeated discharge / recharge cycles. This ability shall be tested by a series of cycles under specified conditions after which the cold cranking performance and the 20h capacity shall be determined (see 6.6).

Deep discharge test represents ability of battery to overcome an over discharge in a vehicle by small loads during parking a vehicle for a long time (see 6.7).

4.1.6 *Water consumption* test checks if the battery can keep its performance under extended exposure to heat and overcharge conditions. It is measured as loss of weight during overcharge of a fully charged battery and is defined as g/Ah C_e (see 6.8).

4.2 Mechanical characteristics

4.2.1 *Vibration resistance* represents the ability of a battery to maintain service under acceleration forces. (see 6.9)

4.2.2 *Electrolyte retention* is the ability of a battery to retain electrolyte under specified mechanical conditions (see 6.9). Valve regulated batteries are submitted to a special test (see 6.10).

5 General test conditions

5.1 Sampling of batteries

All tests shall be carried out on new battery samples. Samples shall be considered as new no later than

- 30 days after the acid filling and formation date in the case of filled and charged batteries,
- 60 days after shipment date of the manufacturer in the case of dry-charged batteries.

Out of different production or sampling lots 7 batteries shall be selected for testing. Six of these batteries shall be used for the tests. In case of equipment failures or technical deviation one battery can be replaced to repeat the complete sequence for this battery.

All tests shall be performed only if above conditions and conditions according to 0 are fulfilled.

5.2 Charging method - Definition of a fully-charged battery

All tests, except that in 7.2.2, shall commence with fully-charged batteries.

Batteries shall be considered as fully-charged if they have undergone the charging procedures. Prior to the first capacity test, the battery charge shall be limited to 16h.

If not specified differently by the battery manufacturer, the batteries shall be charged according to Table 1.

Table 1 : charging method

Battery Type	Voltage U_c	Current	Time	Battery temperature	Remarks
Flooded batteries having size according to EN 50342–2	16,00 V ± 0,05 V	5 I_n	24 h (16 h[a])	15 °C to 35 °C	
Flooded batteries having size according to EN 50342–4	16,00 V ± 0,05 V no limitation	5 I_n I_n	20 h (16 h[a]) 4 h (0 h[a])	15 °C to 35 °C	Step 1 Step 2
Valve regulated batteries	14,80 ± 0,05 V	5 I_n	24 h (16 h[a])	15 °C to 35 °C	
[a] after cranking performance test and prior to first capacity check (Step 1 in Table)					

All charges shall be performed with batteries in a water bath at 25 °C ± 2 °C according to section 5.3.2.

NOTE Using the water bath it is generally accepted that the battery temperature during the charge will be maintained in the required range.

5.3 Test equipment

5.3.1 Measuring instruments

The range of instruments used shall be appropriate for the magnitude of the parameters to be measured. The minimum accuracy of test equipment is given in Table 2.

Table 2 : accuracy of test equipment

parameter	Accuracy of test equipment
Current for CCA tests	0,5 %
Current for other tests	1 %
Voltage	±0,04 V
Temperature	±1 K
Time	±1 %
Density of acid	≤ 0,005 kg/l
Internal resistance	±3 %
Weight of battery	±1 g below 30kg ±5 g above 30kg

The instruments used for measuring time shall be graduated in hours, minutes and seconds.

5.3.2 Water bath

If a test needs to be carried out in a water bath, the following conditions shall be fulfilled. The terminal base of the battery shall be at least 15 mm but not more than 25 mm above the water surface level. If several batteries are in the same water bath then the distance between them and also the distance to the walls of the bath shall be at least 25 mm.