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Svinčeno-kislinske zaganjalne baterije - 6. del: Baterije za mikrociklične aplikacije

Lead-acid starter batteries - Part 6: Batteries for Micro-Cycle Applications

Blei-Akkumulatoren-Starterbatterien - Teil 6 : Batterien für Mikrozyklen-Anwendungen

Batteries d'accumulateurs de démarrage au plomb - Partie 6: Batteries pour applications micro-cycles

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Lead-acid starter batteries - Part 6: Batteries for Micro-Cycle Applications

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Blei-Akkumulatoren-Starterbatterien - Teil 6 : Batterien für Mikrozyklen-Anwendungen

This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2014-11-21.

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.

This draft European Standard was established by CENELEC in three official versions (English, French, German).
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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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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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58 # Foreword

59 This document (prEN 50342-6:2014) has been prepared by CLC/TC 21X "Secondary cells and
60 batteries".

61 This document is currently submitted to the Enquiry.

62 **CLC/TC 21X general remark:**

63 In parallel to the development of this prEN 50342-6 draft, rework of the EN 50342-1:2006 standard is
64 ongoing. This draft has been widely aligned to the reworked EN 50342-1 version to avoid parallel
65 definitions and tests. As the new EN 50342-1 version is not published by now, all references have
66 been set to the currently valid version. Once the updated EN 50342-1 standard will be available, some
67 parts of this prEN 50342-6 draft will not be in use any longer and will be referenced to EN 50342-1 to
68 avoid double definitions.

69 Such paragraphs are marked with a light grey background colour in the present draft and will be
70 removed in future reworked versions of this document, once new references can be made to the
71 upcoming EN 50342-1 standard.

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1 Scope

This standard is applicable to lead-acid batteries with a nominal voltage of 12 V, used primarily as power source for the starting of internal combustion engines (ICE), lighting and also for auxiliary equipment of ICE 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. The batteries under scope of this standard are used for micro-cycle applications in vehicles which can also be called Start-Stop (or Stop-Start, idling-stop system, micro-hybrid or idle-stop-and-go) applications. In cars with this special capability the internal combustion engine is switched off during a complete vehicle stop, during idling with low speed or during idling without the need of supporting the vehicle movement by the internal combustion engine. During the phases in which the engine is switched off, most of the electric and electronic components of the car have to be supplied by the battery without support of the alternator. In addition, in most cases an additional regenerative braking (recuperation or regeneration of braking energy) function is installed. The batteries under these applications are stressed in a completely different way compared to classical starter batteries. Aside of these additional properties, those batteries have to crank the ICE and support the lighting and also auxiliary functions in a standard operating mode with support of the alternator when the internal combustion engine is switched on. All batteries under this scope have to fulfil basic functions which are tested under application of EN 50342-1.

This standard is applicable to batteries for the following purposes:

- Lead-acid batteries of the dimensions according to EN 50342-2 for vehicles with the capability to automatically switch off the ICE during vehicle operation either stand still or moving (“Start-Stop”);
- Lead-acid batteries of the dimensions according to EN 50342-2 for vehicles with Start-Stop applications with the capability to recover braking energy or energy from other sources.

This standard is not applicable to batteries for purposes other than mentioned above.

Remark: The applicability of this standard also for batteries according to EN 50342-4 is under consideration.

2 Normative references

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

EN 50342-1:2006/A1:2011, *Lead-acid starter batteries – Part 1: General requirements and methods of test*

EN 50342-2:2007, *Lead-acid starter batteries – Part 2: Dimensions of batteries and marking of terminals*

UN/ECE Regulation ECE37, *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*.

IEC 60050-482:2004, *International Electrotechnical Vocabulary, Part 482: Primary and secondary cells and batteries*

2006/66/EC, *Directive on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC*

2008/12/EC, *Amendment on Directive 2006/66/EC*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Designation of starter batteries

Batteries are classified according to their types (Table 1):

Table 1 - Battery types and definitions

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 (absorbent glass mat). In case electrolyte is immobilized by fixing as gel this type of VRLA battery is called GEL battery.

3.2 Condition on delivery

3.2.1 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 12.80V to 13.00 V for valve regulated types at 25 °C unless otherwise specified by the manufacturer.

3.2.2 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. 24 h after an initial charge (according to 7.1), the electrolyte density or OCV shall be within the ranges specified in 3.2.1. In batteries with lid without plugs checking electrolyte density is generally not possible. In this cases OCV is to check only according to 3.2.1.

- or dry charged as defined in chapter 9.

Valve regulated batteries are normally supplied in a state ready for use. 24 h after an initial charge (according to 7.1) OCV shall be within ranges specified in 3.2.1. For these batteries the electrolyte is not accessible and therefore its density cannot be checked.

4 General requirements - Identification and labelling

The batteries shall be identified according to the legal demands within the European community applying the regulations of the battery directive 2006/66/EC and the amendment 2008/12/EC or their equivalent national laws. For detailed information about measurement and labelling the EN 50342-1 has to be used.

In addition to the mandatory information defined in EN 50342-1, 2.1 and Annex A, the battery shall be marked with the micro-cycling performance level according to this standard (Subclause 8.2).

For better identification and comparison of batteries under the scope of this standard, a special label specified in Annex B shall be used by the battery manufacturer.

5 General test condition

5.1 Characteristics and abbreviations

5.1.1 Capacity C_n

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 C_{20}. It has to be indicated by the manufacturer as nominal 20h capacity C_{20} (Ah).

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

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

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 (Subclause 7.7).

5.1.2 Cold cranking current I_{cc}

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 7.8.

5.2 Syntax of test descriptions

The test description is given in tabular form. All test steps shall be carried out in a water bath according to 5.3.3 at the given temperature, if nor stated otherwise.

The following definitions and acronyms are used:

Test steps:

Table 2 - Test steps

Acronym	*Test step*	*Description*
CHA	Charge	Battery to be charged with given parameters
DCH	Discharge	Battery to be discharged with given parameters
PAU	Pause	No charging or discharging but measurement of voltage as required. If the battery is connected to the test unit, there must be no quiescent current.
RPT	Repeat	Instruction to repeat certain steps several times
CAS	Case of	Decision point leading to different actions dependent on the value of the reference variable

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178 Description of columns:

179 **Table 3 - Description of columns**

Column text	*Description*
Structure	General explanation of test block
N°	Numbering of individual test steps
Step	Definition of test phase of individual step according to Table 2. NOTE all steps in each table are numbered subsequently starting at “10” The next table of the same section starts at “20”, etc. Example: 10 Action 1 11 Action 2 12 Action 3 20 Action 1 21 Action 2 22 Action 3 23 Action 4
t	Duration of the individual step in days [d], hours [h] or seconds [s]
U [V]	Voltage in Volts to be maintained during the step. In case of a “CHA” phase this is the constant charging voltage to be given by the rectifier. In case of a “DCH” phase this is a cut off criteria at which the phase has to be stopped for the defined current.
I [A]	Current in Ampere to be maintained during the step. In case of a “CHA” phase this is a current limitation for this step. In case of a “DCH” phase this is the constant discharge current to be given by the rectifier
Description	Explanation of individual test step
Data acquisition frequency	Recommended data acquisition frequency
Result of measurement of each step	Final result of the individual test step to be reported

180
181
182 Acronyms:

183 **Table 4 - Acronyms**

Acronym	*Description*
CCA	Cold cranking amps [A]
C_e	Effective capacity [Ah]
C_n	Nominal capacity [Ah]
C_{rch}	Recharged capacity [Ah]
DoD	Depth of discharge [% of C_n]
EOS	End of step
I_{CHA}	Charge current [A]
I_{DCA}	Weighted normalized dynamic charge acceptance, measured in A per Ah nominal capacity C_n [A/Ah]
I_{DCH}	Discharge current [A]
I_n	Nominal discharge current [A] I_n [A] = C_n [Ah] / 20 [h]

Acronym	*Description*
I_c	Average charge current in DCA test after charge history [A]
I_d	Average charge current in DCA test after discharge history [A]
I_r	Average charge current in DCA test during regenerative braking [A]
Q_{CHA}	Charged capacity [Ah]
Q_{DCH}	Discharged capacity [Ah]
R_{dyn}	Calculated dynamic internal resistance [Ω]
R_i	Internal resistance [Ω]
RC	Reserve capacity (discharge with a fixed current of 25 A to U=10.5 V), used in DCA test, Subclause 7.3
t_{DCH}	Discharge time [s]
U_c	Charging voltage [V]

5.3 Requirements for measuring equipment capability

5.3.1 Equipment requirements for the micro-hybrid test MHT (Subclause 7.2)

Table 5 - Equipment requirements for the micro-hybrid test MHT

Parameter	*Range*	*Accuracy*	*Sampling rate*	*Sampling accuracy*
U_{CHA}	14…16 V	± 0.05 V	10 ms	± 0.01 V
I_{CHA}	0…100 A	± 0.1 %	10 ms	± 0.1 %
Q_{CHA}			10 ms	± 1 mAh
U_{DCH}	6...14 V		10 ms	± 0.01 V
I_{DCH}	0...300 A with 300 A t_{DCH} ≥ 1s every minute, transition time < 0.01 s	± 0.5 %	10 ms	± 0.1 %
Q_{CHA}			10 ms	± 1 mAh

5.3.2 Equipment requirements for the dynamic charge acceptance test DCA (Subclause 7.3)

Table 6 - Equipment requirements for the dynamic charge acceptance test DCA

Parameter	*Range*	*Accuracy*	*Sampling rate*	*Sampling accuracy*
U_{CHA}	14…16 V	± 0.05 V	200 ms	± 0.01 V
I_{CHA}	0…200 A	± 0.1 %	200 ms	± 0.1 %
Q_{CHA}			10 ms	± 1 mAh
U_{DCH}	6...14 V		200 ms	± 0.01 V
I_{DCH}	0...100 A	± 1.0 %	200 ms	± 0.1 %
Q_{CHA}			10 ms	± 1 mAh

Computer controlled unit needed with the ability to use integrated charge balance (e.g. Q_{CHA} and Q_{DCH}) for terminating discharge steps. The software must be able to output the information in the format of standard table calculation programs or special software to output tables or graphs.

5.3.3 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. Minimum soak time for batteries in water bath is 4 h.

Remark: Especially for testing temperatures of 40 °C or more, the surface of the water should be covered with floating elements to improve the isolation against air and to avoid evaporation of water. If not stated differently in the individual test description the tolerance for the temperature of the water bath is ± 2°C.