

This is a preview - click here to buy the full publication



IEC 62973-2

Edition 1.0 2020-05

# INTERNATIONAL STANDARD



---

**Railway applications – Rolling stock – Batteries for auxiliary power supply systems –  
Part 2: Nickel Cadmium (NiCd) batteries**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 45.060.01; 29.220.99

ISBN 978-2-8322-8234-2

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references .....	8
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms.....	11
4 General requirements .....	12
4.1 Definitions of components of a battery system, refer to Figure 1 (images are examples).....	12
4.2 Definitions of NiCd battery type.....	12
4.2.1 General .....	12
4.2.2 Sintered/PBE plate/electrode technology .....	13
4.2.3 Sintered/sintered plate/electrode technology .....	13
4.2.4 Fiber plate/electrode technology .....	13
4.2.5 Pocket plate/electrode technology .....	13
4.3 Environmental conditions .....	13
4.4 System requirements .....	13
4.4.1 System voltage.....	13
4.4.2 Charging requirements .....	15
4.4.3 Discharging requirements .....	17
4.4.4 Charge retention (self-discharge).....	18
4.4.5 Requirements for battery capacity sizing.....	18
4.5 Safety and protection requirements.....	19
4.5.1 General .....	19
4.5.2 Deep discharge of batteries .....	19
4.5.3 Temperature compensation during charging .....	20
4.6 Fire protection .....	20
4.7 Maintenance .....	20
4.8 Charging characteristics .....	20
4.9 Optional additional components to battery system.....	20
4.9.1 General .....	20
4.9.2 Battery information system .....	21
4.9.3 Battery heater.....	21
4.9.4 Thermostat or cut-off switch.....	21
5 Mechanical design of battery system .....	21
5.1 General.....	21
5.2 Interface mechanism.....	21
5.3 Location of battery system on the vehicle.....	21
5.4 Accessibility to the battery .....	22
5.5 Shock and vibration .....	22
5.6 Ventilation of battery box .....	22
5.7 Water filling system.....	22
6 Electrical interface.....	22
6.1 General.....	22
6.2 External electrical connections interface .....	23

7	Markings.....	23
7.1	Safety signs .....	23
7.1.1	Outside the box .....	23
7.1.2	Tray, crate or other places inside the box .....	23
7.1.3	Cells or monobloc batteries .....	23
7.2	Nameplate .....	24
7.2.1	Battery box .....	24
7.2.2	Nameplates on tray, crate or other nameplates inside the box .....	24
7.2.3	Cells or monoblocs .....	24
8	Storage and transportation conditions.....	24
8.1	Transportation .....	24
8.2	Storage of batteries .....	24
9	Testing .....	25
9.1	General.....	25
9.2	Type test.....	25
9.2.1	General .....	25
9.2.2	Parameter measurement tolerances .....	26
9.2.3	Electrical characteristic tests .....	26
9.2.4	Dielectric test .....	26
9.2.5	Load profile test.....	26
9.2.6	Shock and vibration test .....	26
9.3	Routine test .....	27
9.3.1	General .....	27
9.3.2	Visual checks .....	27
9.3.3	Dielectric test .....	27
9.3.4	Electrical characteristics tests .....	27
Annex A	(informative) Examples of typical load profiles .....	28
A.1	General.....	28
A.2	Example of load profile – High speed train (Figure A.1) .....	28
A.3	Example of load profile – Regional train/ EMU (Figure A.2).....	29
Annex B	(normative) NiCd load profile verification .....	30
B.1	General.....	30
B.2	General methodology .....	30
B.3	Battery sizing documentation .....	31
B.4	Operational verification (load profile test).....	31
B.5	Test report .....	32
Annex C	(informative) Declaration of cell model range representative of the testing.....	33
C.1	Electrical performance declaration .....	33
C.2	Shock and vibration declaration .....	33
Bibliography	.....	34
Figure 1	– Definition of NiCd cell(s), monobloc battery, crate, tray, and box.....	12
Figure 2	– Example of a NiCd cell discharge curve at various constant discharge currents based on percentage of capacity .....	14
Figure 3	– Example of a NiCd cell charge curves .....	15
Figure 4	– Typical NiCd battery charging characteristics .....	17
Figure 5	– Typical schematic of an electrical interface of a battery system.....	23

Figure A.1 – Example of load profile for high speed train (without starting up segment) .....	28
Figure A.2 – Example of load profile for regional train/ EMU (without starting up segment) .....	29
Table 1 – Requirements of the charging characteristics .....	15
Table 2 – Typical NiCd battery charging characteristics .....	16
Table 3 – Parameters and responsibility for battery capacity sizing.....	19
Table 4 – Type test and routine test.....	25

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**RAILWAY APPLICATIONS – ROLLING STOCK –  
BATTERIES FOR AUXILIARY POWER SUPPLY SYSTEMS –**

**Part 2: Nickel Cadmium (NiCd) batteries**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62973-2 has been prepared by IEC technical committee 9: Electrical equipment and systems for railways.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
9/2585/FDIS	9/2594/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62973 series, published under the general title *Railway applications – Rolling stock – Batteries for auxiliary power supply systems*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

This document considers the requirements for vented or partial recombination Nickel Cadmium (NiCd) batteries following IEC 62973-1:2018.

In this document the interface with a LVPS or charger is specified and the LVPS or charger itself is out of scope.

# RAILWAY APPLICATIONS – ROLLING STOCK – BATTERIES FOR AUXILIARY POWER SUPPLY SYSTEMS –

## Part 2: Nickel Cadmium (NiCd) batteries

### 1 Scope

This part of IEC 62973 applies to NiCd rechargeable batteries for auxiliary power supply systems used on railway vehicles. It is an extension of IEC 62973-1:2018 which specifies common requirements for all battery technologies of other parts of IEC 62973. Unless otherwise specified, the requirements of IEC 62973-1:2018 apply.

Battery systems described in this document are used in conjunction with charging systems onboard rolling stock, as described in IEC 62973-1:2018. Charging systems (e.g. LVPS, converters, etc.) are excluded from the scope of this document.

This document also specifies the design, operation parameters, safety recommendations, routine and type tests, as well as marking and designation.

This document is used in addition to IEC 60623:2017 or IEC 62259:2003 for NiCd Cells.

Specific requirements on subcomponents within the battery systems are covered in this document, e.g. temperature measurement components.

When there is an existing IEC standard specifying additional test conditions and requirements for NiCd batteries used in specific railway applications and which conflicts with this document, the latter takes precedence.

The main objective of this document is to achieve standardization of the electrical interfaces by considering NiCd battery parameters to allow for calculating the NiCd battery capacity required for a specific load profile.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60051 (all parts), *Direct acting indicating analogue electrical measuring instruments and their accessories*

IEC 60077-1, *Railway applications – Electric equipment for rolling stock – Part 1: General service conditions and general rules*

IEC 60623:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Vented nickel-cadmium prismatic rechargeable single cells*

IEC 61373:2010, *Railway applications – Rolling stock equipment – Shock and vibration test*

IEC 62259:2003, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Nickel cadmium prismatic secondary single cells with partial gas recombination*

IEC 62485-2:2010, *Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries*

IEC 62973-1:2018, *Railway applications Rolling stock – Batteries for auxiliary power supply systems – Part 1: General requirements*