NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 48038-2026

Lithium primary battery applied for range temperature

宽温锂原电池

Issued on: July 30, 2026 **Implemented on: August 1, 2027**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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1 Scope

This document specifies the model designation, the requirements for shape and performance, the safety requirements for intended use and reasonably foreseeable misuse, the inspection rules, the marking, packaging, transport and storage, and the disposal of wide-temperature lithium primary batteries, and describes the corresponding test methods.

This document applies to the production, inspection and acceptance of wide-temperature lithium primary batteries.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through the normative references in the text. For dated references, only the edition corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

GB/T 2828.1-2012, Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 8897.1-2021, Primary batteries - Part 1: General

GB/T 8897.2-2021, Primary batteries - Part 2: Physical and electrical specifications

GB 8897.4-2008, Primary batteries - Part 4: Safety of lithium batteries

GB/T 8897.6-2024, Primary batteries - Part 6: Environmental guidelines

3 Terms and definitions, abbreviations

3.1 Terms and definitions. The terms and definitions given in GB/T 8897.1-2021 and GB 8897.4-2008 and the following apply to this document.

3.1.1 maximum working temperature: the upper temperature limit, stated by the manufacturer, at which the battery can meet a particular requirement of use.

3.1.2 minimum working temperature: the lower temperature limit, stated by the manufacturer, at which the battery can meet a particular requirement of use.

3.1.3 lithium primary battery applied for range temperature: a lithium primary battery whose maximum working temperature is not lower than 105 °C and whose minimum working temperature is at the same time lower than minus 35 °C.

3.1.4 rated capacity: the capacity of the battery measured under specified conditions and declared by the manufacturer.

3.1.5 nominal voltage: an approximate value of the voltage used to identify a cell or a battery.

3.1.6 AC internal resistance: the internal resistance of the battery measured with a 1 kHz sinusoidal alternating signal.

3.1.7 end-point voltage: the specified voltage at which discharge of the battery is terminated.

3.1.8 closed-circuit voltage: the voltage at the terminals of the battery when it is connected to a load and is discharging.

3.1.9 standard discharge resistance: the value of the resistance used for discharge, as specified by the manufacturer.

3.1.10 minimum average duration: the average of the discharge times obtained, for the number of samples taken, when discharging at the rated load under specified conditions. Note: the purpose is to show that the battery meets the minimum requirements of the applicable standard for its type.

3.2 Abbreviations. The following abbreviations apply to this document: ACIR, AC internal resistance; RT, range temperature.

4 Model designation

The designation system (nomenclature) for wide-temperature lithium primary batteries is

determined by the dimensions and shape of the primary battery, by the electrochemical system and by modifying letters. Model designation follows C.3 of Annex C of GB/T 8897.1-2021. Models, sizes and performance requirements of some common wide-temperature lithium primary batteries are given in Annex A.

The designation method for round cells whose diameter and height are both less than 100 mm is shown in Figure 1. Note 1: the number of cells or batteries connected in parallel is not indicated. Note 2: modifying letters are used to indicate a special extreme construction, load capability or other characteristics.

Example 1: CR2032RT, a wide-temperature battery of the lithium - organic electrolyte - manganese dioxide system consisting of one round cell or of one group of round cells connected in parallel, with a maximum diameter of 20 mm and a maximum height of 3.2 mm.

Example 2: 3CR2032RT, a wide-temperature battery of the lithium - organic electrolyte - manganese dioxide system consisting of three round cells, or of three parallel groups connected in series, with a maximum diameter of 20 mm and a maximum height of 3.2 mm.

5 Requirements for shape and performance

5.1.1 Appearance. The surface of the battery shall be clean, free from obvious scratches, dents and rust, the marking shall be legible, and there shall be no leakage visible to the naked eye.

5.1.2 Dimensions. The dimensions of the battery and their tolerances, at normal temperature and when discharged to the end-point voltage, shall comply with the relevant provisions of GB/T 8897.2-2021 for the corresponding type. During storage at the maximum working temperature and during normal operation the overall height is allowed to exceed the upper limit of the standard, provided that the normal operation of the battery is not affected.

5.2 Open-circuit voltage. When tested according to 7.2, the open-circuit voltage shall meet the manufacturer's specification and the requirements of GB/T 8897.2-2021.

5.3 Closed-circuit voltage. When tested according to 7.3, the closed-circuit voltage shall meet the manufacturer's specification.

5.4 AC internal resistance. When tested according to 7.4, the AC internal resistance shall fall within the range of internal resistance stated by the manufacturer.

5.5 Rated capacity. When tested according to 7.5, the rated capacity shall meet the manufacturer's specification.

5.6 Pulse discharge performance at normal temperature. When tested according to 7.6, the closed-circuit voltage of the battery shall be higher than the end-point voltage specified by

the manufacturer.

5.7 High-temperature discharge performance. When tested according to 7.7, the discharge capacity of the battery shall meet the high-temperature discharge capacity specified by the manufacturer or agreed between the manufacturer and the user.

5.8 High-temperature storage performance. When tested according to 7.8, the closed-circuit voltage measured at high temperature shall be greater than the value specified by the manufacturer or agreed between the manufacturer and the user.

5.9 Low-temperature pulse performance. When tested according to 7.9, the closed-circuit voltage of the battery shall be higher than the end-point voltage specified by the manufacturer.

5.10 High and low temperature shock performance. When tested according to 7.10, after the test has ended and the battery has been kept at ambient temperature for at least 24 h, there shall be no loss of mass and the battery shall not leak, vent, short-circuit, rupture, explode or catch fire.

5.11 Safety requirements. The relevant provisions of GB 8897.4-2008 shall be met.

6 Safety requirements and inspection methods for intended use and reasonably foreseeable misuse

6.1 Requirements for test instruments. The accuracy of the measuring instruments shall be not lower than 0.25 % and their precision not lower than 50 % of the last significant figure. The accuracy of the instrument used for voltage measurement shall be not lower than 0.25 % and its precision not lower than 50 % of the last significant figure, and its internal resistance shall be not less than 1 megohm.

6.2 Ambient temperature. Unless otherwise specified, all inspections are carried out at an ambient temperature of 20 °C plus or minus 5 °C.

6.3 Errors of parameter measurement. The accuracy of all control values (relative to the specified value) or of the measured values (relative to the actual parameter) shall lie within the following limits: a) voltage, +/-1 %; b) current, +/-1 %; c) temperature, +/-2 °C; d) time, +/-0.1 %; e) dimensions, +/-1 %; f) capacity, +/-1 %. The errors above are the combination of the measuring instrument, the measuring technique used and all other errors of the inspection process.

6.4 Items and requirements for intended use and foreseeable misuse. The safety inspection items for lithium batteries under intended use (inspections A to D) and under reasonably foreseeable misuse (inspections E to M), together with their requirements, are given in Table 1. The items under intended use are altitude simulation, thermal shock, vibration and shock; the items under reasonably foreseeable misuse are external short circuit, impact by a heavy mass, crush, forced discharge, abnormal charging, free fall, thermal abuse,