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TEST REPORT

Primary batteries

EN IEC 60086-1 – Part 1: General & EN IEC 60086-2 – Part 2: Physical and electrical specifications

Report Reference No.	:	2404B0730SHA-014
Tested by (name + signature)	:	Michael Zheng
Approved by (name + signature)	:	Liping Chen
Date of issue	:	2024-11-15
Testing Laboratory	:	Intertek Testing Services (Shanghai FTZ) Co., Ltd.
Address	:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China
Testing location/procedure	:	☒ TL ☐ RMT ☐ SMT ☐ WMP ☐ TMP
Address	:	Same as above
Applicant's name	:	Zhejiang Mustang Battery Co., Ltd.
Address	:	No.818 Rongji Road, Luotuo Town, Ningbo, China | 315202
Test specification:		
Standard	:	EN IEC 60086-1: 2021+AC:2022-07;
		EN IEC 60086-2: 2021+AC:2022-07
Test procedure	:	Testing
Non-standard test method	:	N/A
Test item description	:	Extra Alkaline Battery
Trade Mark	:	Raymax
Model and/or type reference	:	LR03 (AAA)
Manufacturer	:	Zhejiang Mustang Battery Co., Ltd.
		No.818 Rongji Road, Luotuo Town, Ningbo, China | 315202
Rating(s)	:	1.5V
Expiration Date	:	Marked 04-2029 on battery bottom
Date Received	:	2024-05-19
Date Test Conducted	:	2024-06-06 to 2024-07-25
Test Result	:	**Pass**

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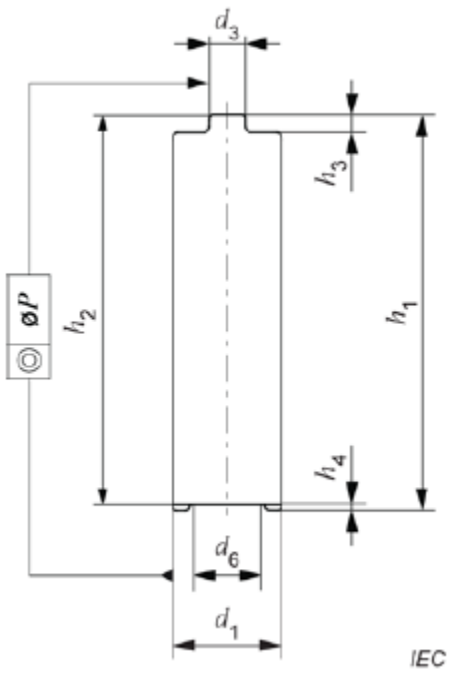
EN IEC 60086-1 – Part 1: General		
Requirements	**Result – Remark**	**Verdict**
Clause 1: Scope This part of EN IEC 60086 is intended to standardize primary batteries with respect to dimensions, nomenclature, terminal configurations, markings, test methods, typical performance, safety and environmental aspects. The object of this part of EN IEC 60086-1 is to benefit primary battery users, device designers and battery manufacturers by ensuring that batteries from different manufacturers are interchangeable according to standard form, fit and function. Furthermore, to ensure compliance with the above, this part specifies standard test methods for testing primary cells and batteries	Alkaline Zinc Manganese Dioxide Battery	Pass
Clause 2: Normative references EN IEC 60086-2, Primary batteries – Part 2: Physical and electrical specifications EN IEC 60086-3, Primary batteries – Part 3: Watch batteries EN IEC 60086-4, Primary batteries – Part 4: Safety of lithium batteries EN IEC 60086-5, Primary batteries – Part 5: Safety of batteries with aqueous electrolyte		Pass
Clause 3: Terms and definitions		Pass
Clause 4: Requirements		Pass
Clause 4.1: General (Design, Battery dimensions, Terminals, Classification, Designation, Marking)	Dimension see table 1; Batteries are marked on intermediate package with IEC designation “LR03, marked on battery body with common designation “AAA”. Polarity “+” and “-”, nominal voltage “1.5V”, trademark “Raymax”, battery expiration date “04-2029” marked on battery bottom. Caution advice also marked on both battery body and intermediate package.	Pass
Clause 4.1.3.2: Contact pressure resistance	A force of 10 N applied through a steel ball of 1 mm diameter at the centre of each contact area for a period of 10 s shall not cause any apparent deformation which might prevent satisfactory operation of the battery.	Pass
Clause 4.2: Performance (Discharge performance, Dimensional stability, Leakage, Open-circuit voltage limits, Service output, Safety)	See table 1 and 2	Pass

Clause 5: Performance – Testing (Discharge testing, include Application tests and Service output tests, OCV testing, Battery dimensions, Leakage and deformation- closed circuit voltage drops for the first time below 40 % of the nominal voltage of the battery)	See table 2	Pass
Clause 6: Performance – Test conditions		N/A
Clause 7: Sampling and quality assurance	Samples selected randomly	Pass
Clause 8 Battery packaging		N/A
Annex A (normative): Criteria for the standardization of batteries		Pass
Annex B (informative): Recommendations for equipment design		N/A
Annex C (normative): Designation system (nomenclature)		Pass
Annex D (informative): Standard discharge voltage Us – Definition and method of determination		N/A
Annex E (informative): Preparation of standard methods of measuring performance (SMMP) of consumer goods		N/A
Annex F (informative): Guidance for proposing value of minimum average duration		N/A
Annex G (normative): Code of practice for packaging, shipment, storage, use and disposal of primary batteries		N/A
Annex H (informative): Compliance checklist		N/A

EN IEC 60086-2 – Part 2: Physical and electrical specifications		
Requirements	**Result – Remark**	**Verdict**
Clause 1: Scope This part of EN IEC 60086 is applicable to primary batteries based on standardized electrochemical systems. It specifies − the physical dimensions, − the discharge test conditions and discharge performance requirements.	Alkaline Zinc Manganese Dioxide Battery	Pass
Clause 2: Normative references EN IEC 60086-1, Primary batteries – Part 1: General; ISO 1101, Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out		Pass
Clause 3: Terms, definitions, symbols and abbreviations		Pass
Clause 4: Battery dimensions, symbols		Pass
Clause 5: Dimensional stability		Pass
Clause 6: Validity of testing		Pass
Clause 7: Constitution of the battery specification tables	Classified as “LR03”.	Pass
Clause 8: Physical and electrical specifications		N/A
Annex A (informative): Tabulation of batteries by application	LR03: 1.5V;	Pass
Annex B (informative): Cross-reference index	Category 1 batteries: LR03	Pass
Annex C (informative): Index		Pass
Annex D (informative): Common designation	LR03 (Common Designation: AAA)	Pass
Annex E (informative): Compliance checklist		N/A

Table 1: Dimensions

This was conducted in accordance with an application test stated in IEC/EN 60086-1/-2.
The battery required to meet the dimensions, which was shown below:



h1 maximum overall height of the battery;
h2 minimum distance between the flats of the positive and negative contacts;
h3 minimum projection of the flat positive contact;
h4 maximum recess of the negative flat contact surface;
d1 maximum and minimum diameters of the battery;
d3 maximum diameter of the positive contact within the specified projection height;
d6 minimum outer diameter of the negative flat contact surface;
⌀ P concentricity of the positive contact.

Dimensions		LR03
h_1	max.	44,5
h_2	min.	43,5
h_3	min.	0,8
h_4	max.	0,5
d_1	max.	10,5
	min.	9,8
d_3	max.	3,8
d_6	min.	4,3
⌀P	max.	0,25

Table 1: Dimensions and OCV measurement (continued)

Designation	Open circuit voltage (V)	Dimensions (mm)								
		h1	h2	h3	h4	d1		d3	d6	ΦP
LR03	Max.	Max.	Min.	Min.	Max.	Max.	Min.	Max.	Min.	Max.
(AAA)	1.68	44.5	43.5	0.8	0.5	10.5	9.8	3.8	4.3	0.25

Sample no.								
All samples under test	1.641 ~ 1.648	44.19 ~ 44.26	1.08 ~ 1.17	-	10.35 ~ 10.42	3.42 ~ 3.50	5.92 ~ 5.97	0.11 ~ 0.12
Verdict	Pass	Pass	Pass	Not applic able	Pass	Pass	Pass	Pass

Table 2: Discharge / Application Tests and leakage and deformation check

Designation: LR03 (AAA)

Application:	Portable lighting	Remote control	Toy	Digital audio
Load:	5.1 Ω	24 Ω	5.1 Ω	50 mA
Daily period:	4 min / h, 8 h / d	15 s / min, 8 h / d	1 h / d	1 h / 12 h, 24 h / d
EV: (V)	0.9 V	1.0 V	0.8 V	0.9 V
MAD:	130 min	14.5 h	2 h	12 h

Test result:

Sample no.				
1	269.5 min	22.4 h	4.9 h	24.2 h
2	269.3 min	22.3 h	4.9 h	24.0 h
3	268.6 min	21.7 h	4.9 h	23.9 h
4	269.2 min	22.5 h	4.8 h	24.2 h
5	268.9 min	22.4 h	4.9 h	23.8 h
6	269.9 min	22.3 h	4.9 h	23.8 h
7	270.0 min	22.3 h	4.9 h	24.0 h
8	268.5 min	22.5 h	4.9 h	23.9 h
Average	269.2 min	22.3 h	4.9 h	24.0 h
Verdict	Pass	Pass	Pass	Pass
Leakage check	No leakage	No leakage	No leakage	No leakage
Deformation check	No deformation	No deformation	No deformation	No deformation

Product Photos:

AAA