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# S P E C I F I C A T I O N S

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|---|---|
| DESCRIPTION | ALKALINE PRIMARY BATTERY - LR03 |
| SPECIFICATION | AAA SIZE /1.5V |
| MAKERS SPECIFICATIO | LR03 |
| PART NO. | C/0 |
| MODEL NO. | ALLKEY-LR03-2017 |
| SPECIAL ARTICLES | |

| MANAGER | CHECK | APPROVAL |
|---|---|---|
| **JunPing Liu** | **Lihui Chen** | **HangJun Wu** |
| 2017/1/3 | 2017/1/3 | 2017/1/3 |
| TERM OF VALIDITY | | 3 YEAR |

| | | |
|---|---|---|
| MAKER | Shenzhen ALLKEY Battery Co., Ltd AlkalineBatteries Branch | 086-0755-29957377<br>086-0755-29957977 |
| ADDRESS | 4/F, Hongwan Commercial Building, 4235# Bao'an District518126, Shenzhen | |

| RECODRD OF REVISION | | Prepared Date | 2017/1/3 |
|---|---|---|---|
| | | Approved Date | 2017/1/3 |
| Part Name | Alkaline Primary battery - LR03 | Version | C/0 |
| Part No. | ALLKEY-LR03-2017 | Page | 1/9 |

| Manager | Check | Approval | Version |
|---|---|---|---|
| JunPing Liu | Lihui Chen | HangJun Wu | C/0 |
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| Version | Reason to modify | Page |
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| Manager | Check | Approval |
|---|---|---|
| JunPing Liu | Lihui Chen | HangJun Wu |

1. Application

This specification is applied to inspection and approval of the alkaline primary batteries LR03 which is manufactured by Shenzhen ALLKEY Battery Co., Ltd Alkaline Batteries Branch.

2. Description

Gradually sloping discharge curve, better low temperature performance, service maintenance, and moderate to high current drains than Manganese dry batteries .(or Carbon Zinc)

3. Features

1) Classification: Alkaline
2) Chemical System: Zinc-Manganese Dioxide(Zn/MnO2)
3) Designation: LR03(IEC & China), 24A(ANSI), SIZE AAA , AM4
4) Nominal Voltage: 1.5Volts
5) Operating Temperature: -10~50℃
6) Moderate Storage Temperature: 10~30℃ (Maximum Allowed storage -40~50℃ but shall not exceed 30days)
7) Approximate Weight: 11.2grams
8) Jacket: Printed plastic label
9) Shelf life: 3years at 20±5℃, 55±20% RH

4. Information for safety use

4.1) Display and storage

Batteries shall be stored in well-ventilated, dry and cool conditions. High temperature and humidity 30℃, over 95% RH and below 40%RH) may cause deterioration of the battery performance or surface corrosion.

4.2) Safety precautions during handling of batteries

a) Always insert batteries correctly with regard to the polarities (+ and -) marked on the battery and equipment. Batteries which are incorrectly placed into equipment may be charged.This can result in leakage explosion and may cause personal injury.

b) Do not short-circuit batteries. When the positive and negative terminals of battery are in electrical contact with each other,the battery become short-circuited. This may result in a rapid temperature rise and venting ,leakage and explosion.

c) Do not mix use old and new batteries or batteries of different types or brands. When batteries of different brand or type are used together, or new and old batteries are used together, some batteries may be over-discharged due to a difference of voltage or capacity. This can result in leakage and may cause personal injury.

d) Exhausted batteries should be immediately removed from equipment and properly disposed.

e) Remove batteries from equipment if it is not to be used for an extended period of time especially seasonal equipment, example air-conditioner and electric-fan.

f) Keep batteries out of the reach of children or not allow children to replace batteries without adult supervision.

g) Clean the battery contacts and also those of the equipment prior to battery installation.

5. Mechanical Characteristics and standard

5.1) Appearance & Dimensions (Unit:mm)

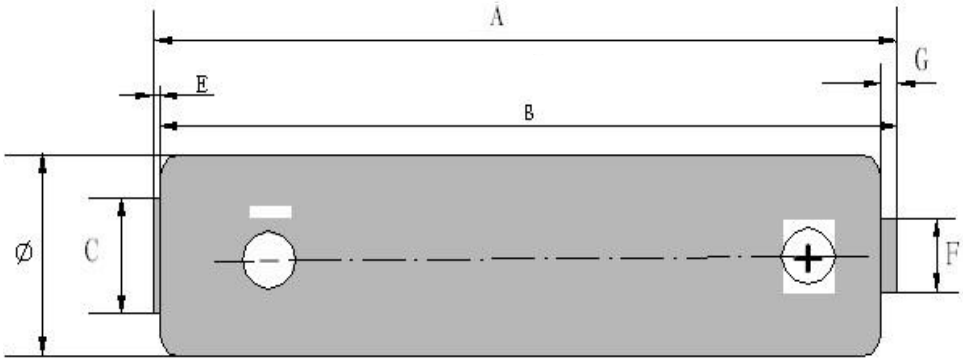
1) Appearance

The battery visually inspected by unaided eye 30cm away from battery. The battery shall be free from dents, scratch, rust and extruded internal compounds, such as sealing compounds and etc,and serious displacement of artwork. Appearance defects that do not interfere with product salability, or its use and function.

2) Dimensions

The dimensions shall be in accordance with the below figures both prior to and after service output test.

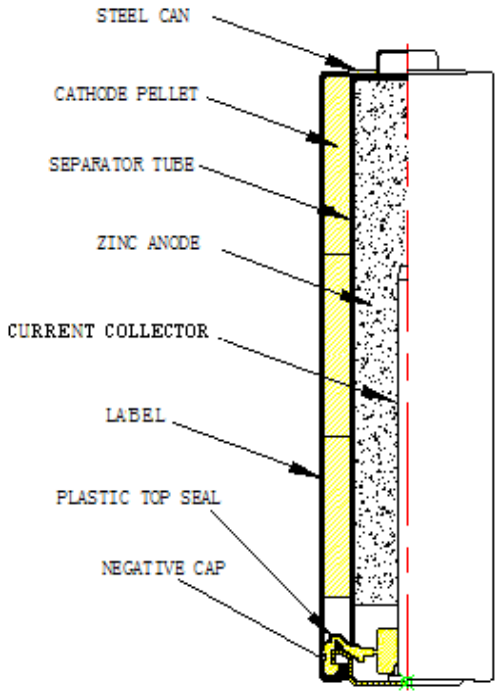
Measuring equipment shall be within an accuracy ±0.05mm.




(Unit:mm)

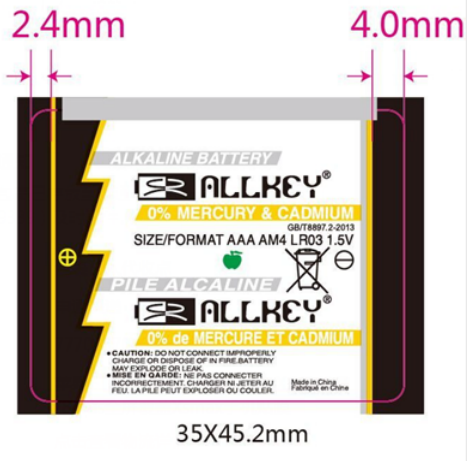
| SPECIFICATION | A | B | C | E | F | G | Φ | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Min. | Max. | Max. | Min. | Max. | Min. |
| LR03 | 44.5 | 43.5 | 4.3 | 0.5 | 3.8 | 0.8 | 10.5 | 9.8 |

5.2) Schematic Diagram (Internal structure Figure)




| No | Part Name | Materials |
|---|---|---|
| 1 | Steel Can | Ni-plated Steel |
| 2 | Cathode Pelet | MnO2 |
| 3 | separator | textile |
| 4 | Anode Gel | Zn+KOH |
| 5 | Current collector | Brass+In |
| 6 | Label | PVC |
| 7 | Seal | nylon |
| 8 | Negative cap | Ni-plated Steel |

5.3)Jacket Marking




* SEPARATE COLLECTION MARK (EU BATTERY DIRECTIVE 2006/66/EC,2013/56/EU)

* DATE CODE : CODED ON LABEL SURFACE

5.4) User Drop Test

This test simulates the situation when a battery is accidentally dropped. The batteries shall be no explosion and leakage after hour.

Method) Undischarged test batteries shall be drop a height of 1M onto a concrete surface. Each test battery shall be dropped two times at X, Y, Z axes.

6. Electrical characteristics and standard.

Unless otherwise stated, all inspections are conducted at 20±2℃, 55±20% RH after stabilization under these conditions for a minimum period of 8 hours. All tests and examinations shall be started within 30 days of receipt. Related sampling standard accordance with ISO 2859-1.

6.1) OCV (Open Circuit Voltage, NLV; No-load voltage)

OCV shall be measured on a voltmeter with the internal resistance ≥1 MΩ.

Minimum 1.50 volts, Maximum 1.68volts

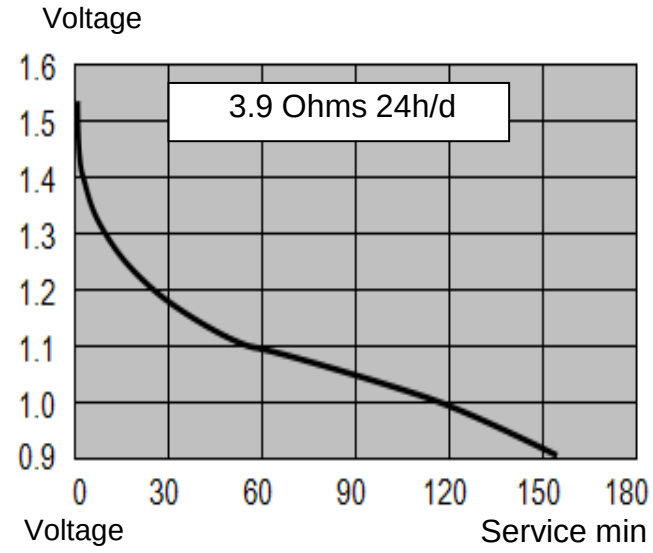
6.2) Service output tests

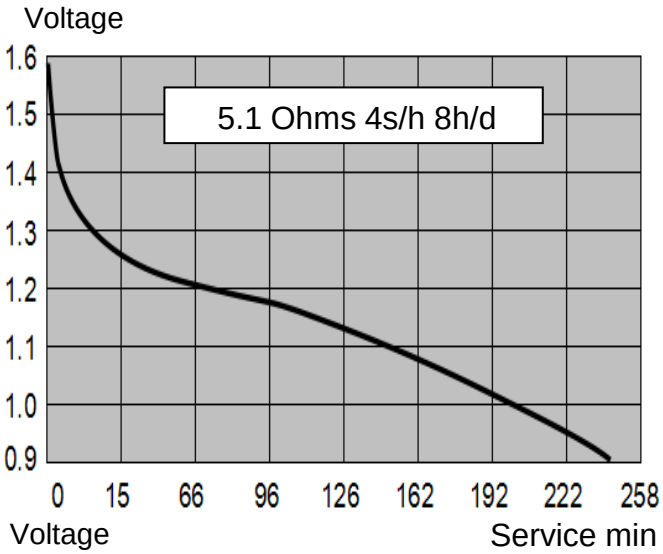
Minimum sample size for each test will be n=9. The batteries shall meet or above the minimum average duration specified below.

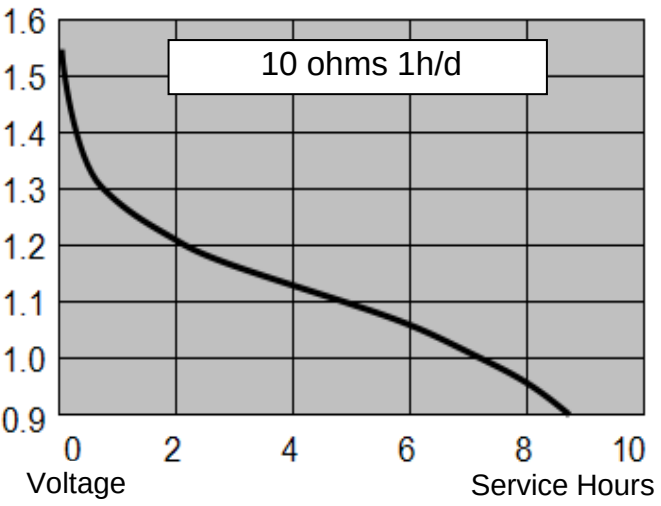
| Load | Daily Period | End Voltage | Unit | M.A.D | Normal |
|---|---|---|---|---|---|
| 3.9Ω | 24h/d | 0.9 | min | 135 | 145 |
| 5.1Ω | 4m/h 8h/d | 0.9 | min | 220 | 240 |
| 5.1Ω | 1h/d | 0.8 | min | 245 | 270 |
| 10Ω | 1h/d | 0.9 | hrs | 7.8 | 8.7 |
| 20Ω | 24h/d | 0.9 | hrs | 18 | 19 |
| 24Ω | 15s/m 8h/d | 1.0 | hrs | 19 | 20 |
| 75Ω | 4h/d | 0.9 | hrs | 70 | 75 |
| 100mA | 1h/d | 0.9 | hrs | 9.2 | 9.8 |
| 600mA | 10s/m 1h/d | 0.9 | cycle | 260 | 320 |

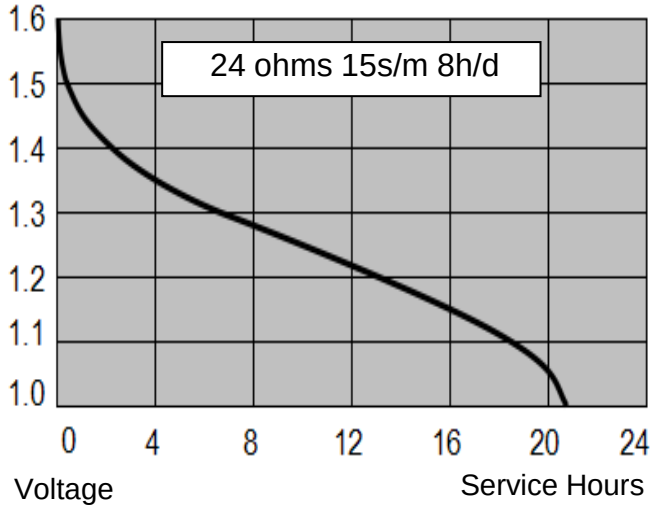
Delayed discharge performance: 93% of M.A.D after 12 months, 85% of M.A.D after 24 months.

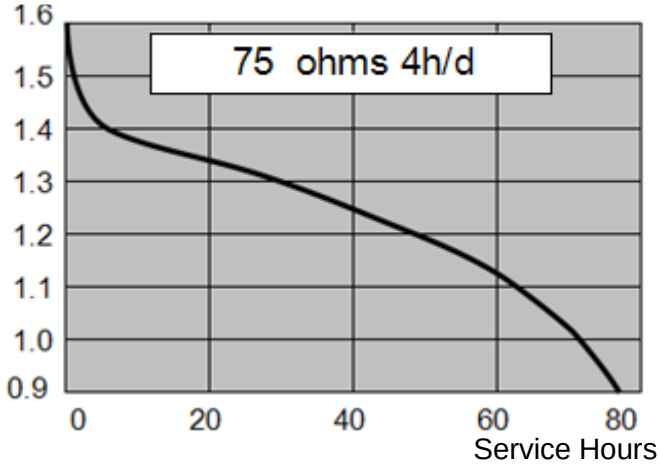
6.3) Graph of Service Output characteristics(Discharge Curve)

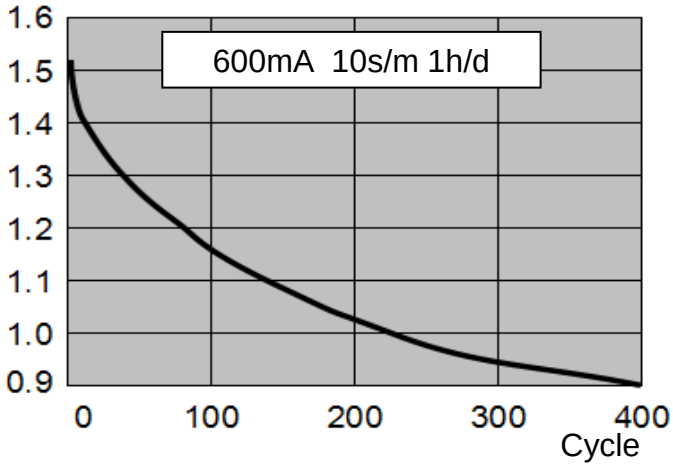


7. Environmental Characteristics and standard

7.1) Leakage

1) High temperature

The batteries shall be stored in the unpacked condition under the 60±2℃,related humidity 90% for 30 days.

After storage visually inspecting shall be no deformation, electrolyte leakage findable.

- Sample size N=10, Ac=0, Re=1.

2) Over-Discharge

After service output test, continuous discharge carried out for the same specimens until on load voltage drop for the first time below 40% [0.6volts] of the nominal voltage of battery. After discharge visually inspecting within 1hours shall be not deformation, leakage findable.

7.2) Heavy metal Contents

Safety or environment regulations and laws are must be inform or discuss with DMEGC prior to placing an order.

1) Total mercury contents of less than 1ppm of a battery weight.
2) Total cadmium contents of less than 20ppm of a battery weight.
3) Total lead contents of less than 40ppm of a battery weight.

7.3) Packing method

| / | composition | Quantity(pcs) | Materials |
|---|---|---|---|
| Cell | 4cell | 4 | Shrinkable PVC Film |
| Display Box | 4×15pack | 60 | Paperboard |
| Carton Box | 60pcs×24Box | 1440 | Corrugated carboard |

8. Reliability test item and criteria

| No. | Item No. | | Test Item | Sampling Plan | Judgment Standard |
|---|---|---|---|---|---|
| 1 | 5.1.1 | Appearance | Appearance & Terminal | ISO 2859-1 I , AQL 1.0 | See 5.1.1) |
| 2 | 5.1.2 | Dimensions | Height | ISO 2859-1 S-2, AQL 1.0 | 43.5~44.5mm |
| | | | Diameter | | 9.8~10.5mm |
| 3 | 6.1 | O.C.V. | Voltage | ISO 2859-1 I , AQL 0.15 | 1.50~1.68volts |
| 4 | 6.2 | Service output | 3.9Ω Cont'-0.9V | N=9 | Ave≥2.25hrs |
| 5 | 7.1 | Leakage | High Temp | N=10 | Ac=0, Re=1 |
| | | | Over discharge | N=9 | Ac=0, Re=1 |
| 6 | / | Packing & Marking | Appearance etc | ISO 2859-1 I , AQL 1.0 | According Order Form |

9. Safety test for intended or reasonably foreseeable misuse

9.1) Storage After Partial Use

This test simulates the situation when an appliance is switched off and the installed batteries are partly discharged. These batteries may be left in the appliance for a long time.

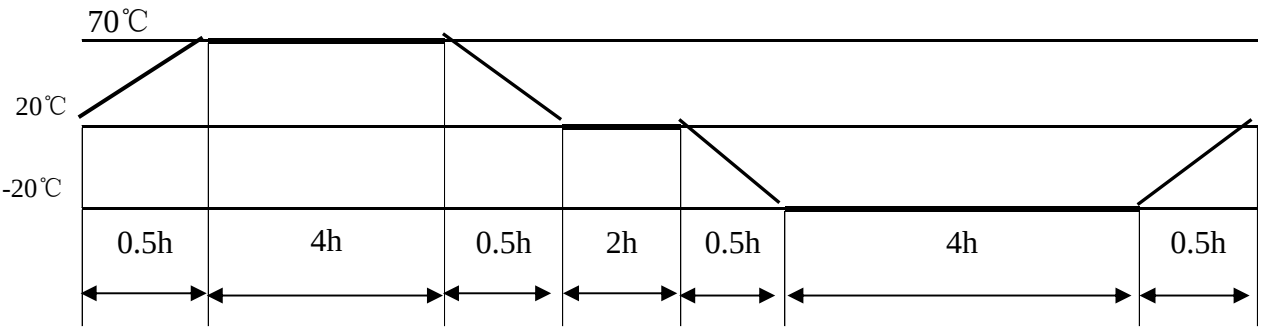
Method) Undischarged battery is discharged during 2hours by 5.1Ω continuous (about 50% of MAD) and followed by storage at 45±5℃ for 30 days.

Requirement) After storage battery shall be no leakage and no explosion during this test.

9.2) Climatic-temperature cycling

1) Place the batteries in a test chamber and raise the temperature of the chamber to 70±5℃ within 30 and maintain the chamber at this temperature for 4hours.
2) Reduce the temperature of the chamber to 20±5℃ within 30min and maintain for 2hour.
3) Reduce the temperature of the chamber to -20±5℃ within 30min and maintain for 4hour
4) Raise the temperature of the chamber to 20±5℃ within 30min
5) Repeat the sequence for a further nine cycles
6) After the 10th cycle, store the batteries for seven days prior to examination.

Requirement) Batteries shall be no explosion during this test.




1cycle (repeat 10 times)

9.3) External short circuit

Undischarged battery shall be connected directly +/- polarity with resistance of the interconnecting circuitry shall not exceed 0.1Ω. The circuit shall be completed for 24hours

Requirement) The batteries should be no explosion during this test.

※ Caution

During this test battery surface temperature is raise near 100℃ within five minutes.

Do not touch the battery surface during this test about 1hour, if not may occur skin injury.

9.4) Over discharge ( Battery mix-up fresh & used or other type battery)

This test simulates the condition when one discharged battery is series-connected with three other undischarged batteries. One undischarged battery is discharged under service output test condition (R1), then three undischarged batteries and one discharged battery of the same brand, same type and origin shall be connected in series. The discharged shall be continued until the total on load voltage falls to four times (n X 0.6V; n is the number of batteries). The value of the on-load resistor (B1) shall be approximately four times the lowest value from the resistor R1.

Requirement) The batteries should be no explosion during this test.

9.5) Incorrect installation

Place three undischarged and unconditioned batteries in a series with one test sample battery reversed, Complete the circuit until vent activation or until the temperature of the reversed battery returns to ambient.

Requirement) The batteries should be no explosion during this test.

9.6) Safety Test Results.

| No. | Test Item | Method | Criteria | n | Result |
|---|---|---|---|---|---|
| 1 | Partial Use | Discharge to 50% of MAD (5.1Ω-continuous) and storage 30days at 45 ±5℃ | NL/NE | 5 | NL/NE |
| 2 | Climatic cycling | Batteries storage -20~70℃ cycling chamber. The cycling is 10 times. | N.E | 5 | N.E |
| 3 | External Short Circuit | Battery is connected with wire directly +/- polarity. 24hours connecting. | N.E | 5 | N.E |
| 4 | Overdischarge (Mixed use) | New battery is series connect with used one, and discharge to (n X the number battery) | N.E | 5set | N.E |
| 5 | Incorrect installation | Place three batteries in a series with one test sample battery reversed | N.E | 5set | N.E |

* N.L : Not Leakage / N.E : Not Explode