

**BATTERY TEST REPORT**

IEC 60896-21 : 2004

IEC 60896-22 : 2004

Report Reference No..... : TH19011001

Tested by

(printed name and signature) ..... : Le Tan Phong

Approved by

(printed name and signature) ..... : Adam Chen

Date of testing..... : 2019-10-24

Date of issue..... : 2019-10-31

Testing laboratory..... : Laboratory Le Long Viet Nam Limited Company

Address..... : Cum Cong Nghiep Duc My, Xa Duc Hoa Dong, Huyen Duc Hoa, Tinh Long An, 81999 Viet Nam . Tell:+84-72-3779666

Applicants Name..... : KUNG LONG BATTERIES INDUSTRIAL CO., LTD

Address..... : No., 6 Tzu-Li 3 Road, Nantou City 54067, Nantou Hsien, Taiwan

Test Specification:

Standard..... : IEC 60896-21:2004 and IEC 60896-22:2004

Non-standard test method..... : N/A

Test Report Form No..... : IEC 60896-21:2004 and IEC 60896-22:2004

Test item description..... : Valve Regulated Lead-Acid Battery

Trade Mark..... : 

Model/Type reference..... : WP1236W

Series model..... : N/A

Rating(s) ..... : 12V 9Ah ; 36W@ 15minute-rate to 1.6V per cell

Battery dimension..... : 151mm x 65mm x 102mm (LxWxH)

Possible Test Case Verdicts:

Test case does not apply to the test object.....N/A

Test object does meet the requirement.....P(Pass)

Test object does not meet the requirement.....F(Fail)

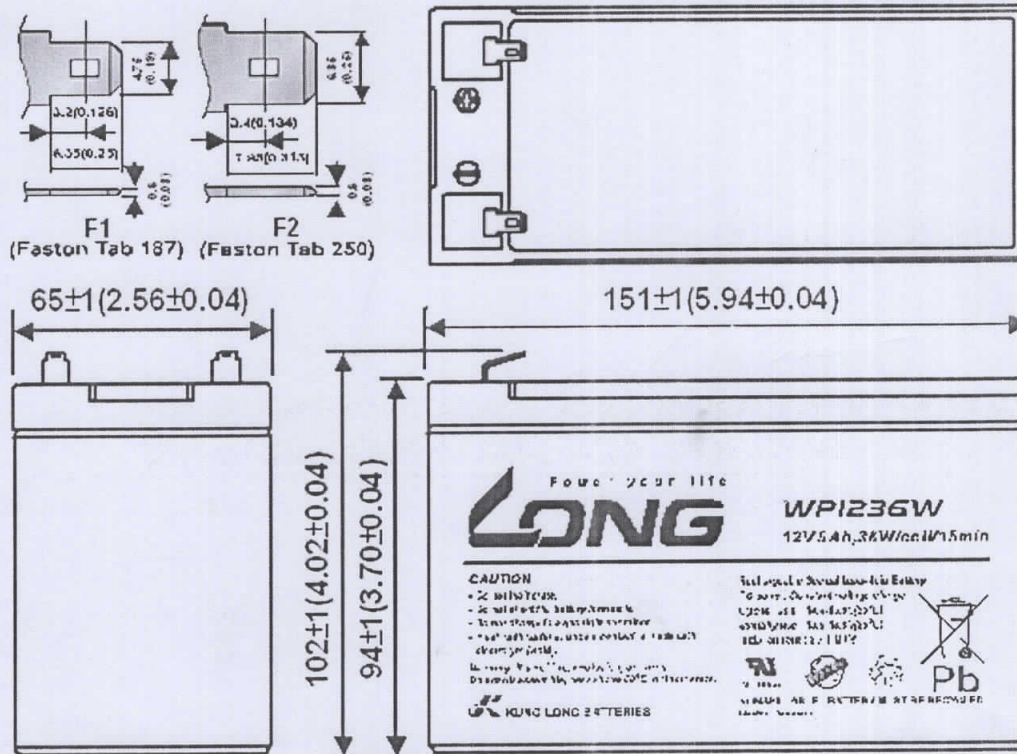
Testing Laboratory information:

Laboratory Le Long Viet Nam Limited Company

Cum Cong Nghiep Duc My, Xa Duc Hoa Dong, Huyen Duc Hoa, Tinh Long An, 81999 Viet Nam . Tell:  
+84-72-3779666



Trade Mark And Dimension:



1. Test Item:

| No | Test Item                                                           | Clauses. | Verdict |
|----|---------------------------------------------------------------------|----------|---------|
| 1  | Gas Emission                                                        | 6.1      | p       |
| 2  | High current tolerance<br>(High current discharge capacity)         | 6.2      | P       |
| 3  | Short circuit current and DC internal resistance                    | 6.3      | P       |
| 4  | Protection against internal ignition from external<br>spark sources | 6.4      | P       |
| 5  | Protection against ground short propensity                          | 6.5      | P       |
| 6  | content and durability of required markings                         | 6.6      | P       |
| 7  | Material Identification                                             | 6.7      | P       |
| 8  | Valve operation                                                     | 6.8      | P       |
| 9  | Flammability rating of materials                                    | 6.9      | P       |
| 10 | Intercell connector performance                                     | 6.10     | P       |





|    |                                                                                   |      |   |
|----|-----------------------------------------------------------------------------------|------|---|
| 11 | Discharge Capacity                                                                | 6.11 | P |
| 12 | Charge retention during storage                                                   | 6.12 | P |
| 13 | Float service with daily discharges 25°C, 80%                                     | 6.13 | P |
| 14 | Recharge behavior                                                                 | 6.14 | P |
| 15 | Service life at an operating temperature of 40°C all units to 0.8 C <sub>rt</sub> | 6.15 | P |
| 16 | Impact of a stress temperature of 60°C, 80%                                       | 6.16 | P |
| 17 | Abusive over- discharge                                                           | 6.17 | P |
| 18 | Thermal run away sensitivity                                                      | 6.18 | P |
| 19 | Low temperature sensitivity                                                       | 6.19 | P |
| 20 | Dimensional stability at elevated internal pressure and temperatures              | 6.20 | P |
| 21 | Stability against mechanical abuse of units during installation                   | 6.21 | P |

## 2. Test Result:

| No. | Test Item                                                        | Clauses. | Technical Specification                                                                                                                                                                         | Test data                                                                                                                          |
|-----|------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Gas Emission<br>(V=Voltage per cell)                             | 6.1      | $U_{lo} \leq 0.05 \text{ ml/cell} \cdot \text{h} \cdot \text{Ah} (25^\circ\text{C})$                                                                                                            | 0.036                                                                                                                              |
|     |                                                                  |          | $2.40 \text{ Vpc} \leq 1.70 \text{ ml/cell} \cdot \text{h} \cdot \text{Ah} (25^\circ\text{C})$                                                                                                  | 0.42                                                                                                                               |
| 2   | High current tolerance<br>(High current discharge capacity)      | 6.2      | Discharge with 3 times of 15min rate current, or with a current equal to the maximum allowable discharge current. there is no melting or continuous power loss.<br>$V_{5min} > 2.0 \text{ Vpc}$ | Discharge with 3 times of 15min large current, there is no melting or continuous power loss.<br>$V_{5min} = 12.26 \text{ Voltage}$ |
| 3   | Short circuit current and DC internal resistance                 | 6.3      | $I_{sc}$                                                                                                                                                                                        | 135A<br>(5 seconds at most)                                                                                                        |
|     |                                                                  |          | Internal Resistance                                                                                                                                                                             | 14.0mΩ<br>(measured by HIOKI 3555 Battery Hitester)                                                                                |
| 4   | Protection against internal ignition from external spark sources | 6.4      | There is no fast burn or explosive apart from valve                                                                                                                                             | There is no fast burn or explosive apart from valve                                                                                |
| 5   | Protection against ground short propensity                       | 6.5      | No earthing short or leakage                                                                                                                                                                    | No earthing short or leakage                                                                                                       |



|     |                                                                         |      |                                                                                                                                                                                                                        |                                                                                                 |
|-----|-------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 6   | content and durability of required markings                             | 6.6  | Marks are easy for long-lasting                                                                                                                                                                                        | Marks are easy for long-lasting                                                                 |
| 7   | Material Identification                                                 | 6.7  | ISO symbol is visible, and the symbol is remain after put in chemical reagent place                                                                                                                                    | ISO symbol is visible, and the symbol is remain after put in chemical reagent place             |
| 8   | Valve operation                                                         | 6.8  | Check the gas outlet before and after high-temp.                                                                                                                                                                       | Open/close valve pressure (Kpa)is:<br>Bef. high-temp.: 22.4/20.6<br>After high-temp.: 23.3/21.2 |
| 9   | Flammability rating of materials                                        | 6.9  | Indicate sample's value with same thickness of containers and lids                                                                                                                                                     | UL94HB                                                                                          |
| 10  | Intercell connector performance                                         | 6.10 | Indicate highest temp. reached                                                                                                                                                                                         | 35□                                                                                             |
| 11. | Discharge Capacity                                                      | 6.11 | $C_{10} \geq 8.55\text{Ah}$                                                                                                                                                                                            | 107.6 % @0.90A                                                                                  |
|     |                                                                         |      | $C_8 \geq 8.19\text{Ah}$                                                                                                                                                                                               | 108.8% @1.026A                                                                                  |
|     |                                                                         |      | $C_3 \geq 6.75\text{Ah}$                                                                                                                                                                                               | 110.3% @2.25A                                                                                   |
|     |                                                                         |      | $C_1 \geq 4.95\text{Ah}$                                                                                                                                                                                               | 111.2% @4.95A                                                                                   |
|     |                                                                         |      | $C_{0.25} \geq 3.15\text{Ah}$                                                                                                                                                                                          | 112.5% @12.6A                                                                                   |
| 12  | Charge retention during storage                                         | 6.12 | $\geq 70\%$                                                                                                                                                                                                            | 77%                                                                                             |
| 13  | Float service with daily discharges 25°C, 80%                           | 6.13 | Total Cycle times $\geq 300$                                                                                                                                                                                           | 313 times                                                                                       |
| 14  | Recharge behavior                                                       | 6.14 | $R_{br24h} \geq 90\%$                                                                                                                                                                                                  | 94.7%                                                                                           |
|     |                                                                         |      | $R_{br168h} \geq 98\%$                                                                                                                                                                                                 | 99.8%                                                                                           |
| 15  | Service life at an operating temperature of 40°C all units to 0.8 $C_R$ | 6.15 | - Brief duration exposure time $\geq 500\text{d}$<br>- Medium duration exposure time $\geq 750\text{d}$<br>- Long duration exposure time $\geq 1100\text{d}$<br>- Very long duration exposure time $\geq 1700\text{d}$ | 785d (Medium duration exposure time)                                                            |
| 16  | Impact of a stress temperature of 60°C, 80%                             | 6.16 | - Brief duration exposure time $\geq 105\text{d}$<br>- Medium duration exposure time $\geq 175\text{d}$<br>- Long duration exposure time $\geq 250\text{d}$<br>- Very long duration exposure time $\geq 350\text{d}$   | 184d (Medium duration exposure time)                                                            |
| 17  | Abusive over-discharge                                                  | 6.17 | Unbalanced series over discharge $C_{aod} > 0.80$                                                                                                                                                                      | 0.88                                                                                            |
|     |                                                                         |      | Cycle over discharge $C_{aoc} > 0.90$                                                                                                                                                                                  | 0.98                                                                                            |
| 18  | Thermal run away sensitivity                                            | 6.18 | Battery temperature change at 2.40VPC, the temperature after 168h                                                                                                                                                      | 25□                                                                                             |

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|----|----------------------------------------------------------------------|------|-------------------------------------------------------------------|-----------------------------------------|
|    |                                                                      |      | Battery temperature change at 2.60VPC, the temperature after 168h | 31□                                     |
| 19 | Low temperature sensitivity                                          | 6.19 | $C_{als} > 95\%$                                                  | 96.7%                                   |
| 20 | Dimensional stability at elevated internal pressure and temperatures | 6.20 | percentage deviation over the girth value                         | $\Delta L = 0.06\%$                     |
| 21 | Stability against mechanical abuse of units during installation      | 6.21 | No fracture or leak of the battery case                           | No fracture or leak of the battery case |

— — — The End of Test Report — — —

