



BATTERY TEST REPORT

IEC 60896-21 : 2004

IEC 60896-22 : 2004

Report Reference No..... : TQ2207005

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

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

Date of testing Date of testing..... : 2022-07-03

Date of issue..... : 2022-07-06



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..... : KPH110-12N

Series model..... : N/A

Rating(s) ..... : 12V 110Ah

Battery dimension..... : 338mm x 170mm x 217mm

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:

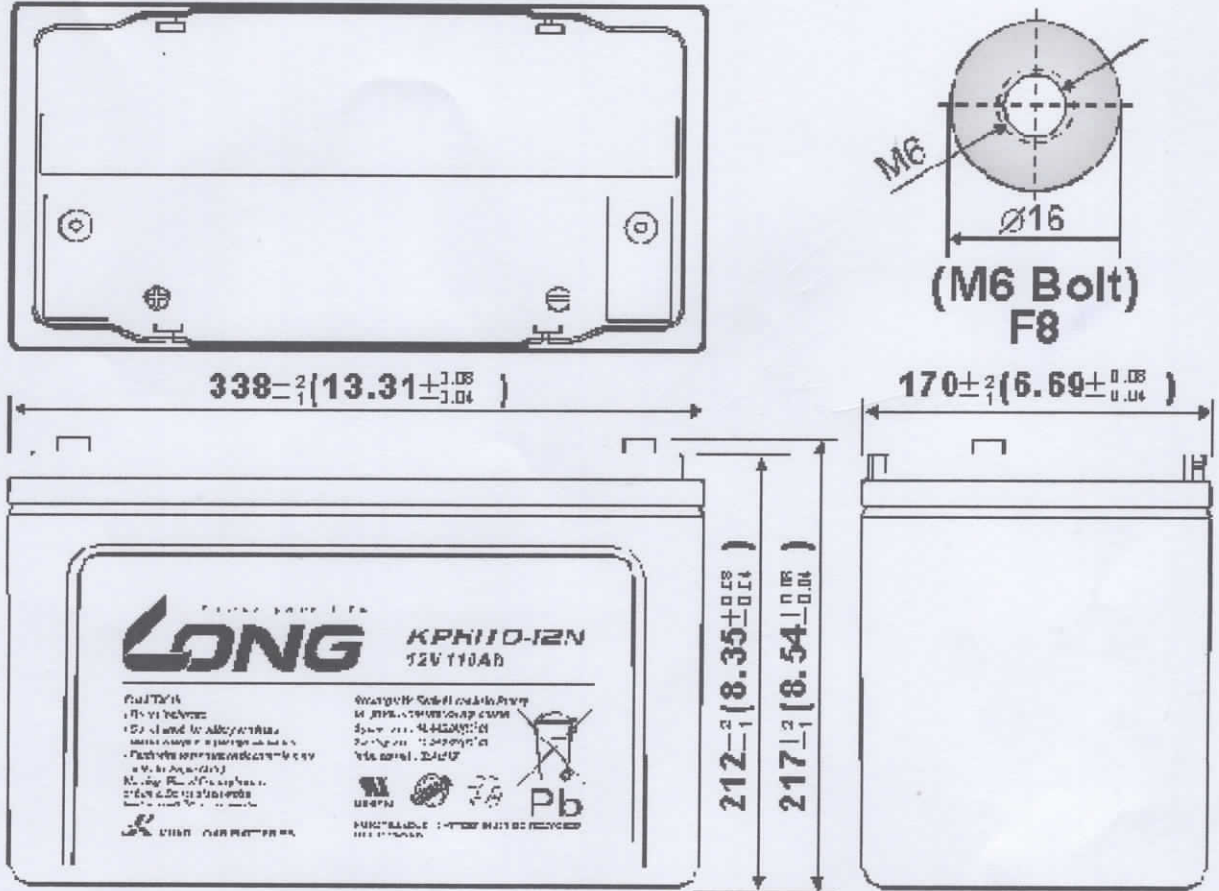
Laboratory Le Long Viet Nam Limited Company

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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 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      | $U_{flo} \leq 0.05 \text{ml/cell} \cdot \text{h} \cdot \text{Ah} (25^\circ\text{C})$  | 0.0098   |
|     |  |          | $2.40 \text{Vpc} \leq 1.70 \text{ml/cell} \cdot \text{h} \cdot \text{Ah} (25^\circ\text{C})$  | 0.0115   |
| 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>$V_{5\text{min}} > 2.0 \text{Vpc}$ | Discharge with 3 times of 15min large current, there is no melting or continuous power loss.<br>$V_{5\text{min}} = 12.95 \text{Voltage}$ |
| 3   | Short circuit current and DC internal resistance                 | 6.3      | $I_{sc}$  | 1200A<br>(5 seconds at most)   |
|     |  |          | Internal Resistance   | 5.0mΩ<br>(measured by HIOKI 3554 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   | ABS UL94 HB   |
| 10  | Intercell connector performance  | 6.10 | Indicate highest temp. reached   | 35.2°C  |
| 11. | Discharge Capacity   | 6.11 | $C_{10} \geq 105Ah$  | 105.6% @11.0A   |
|     |  |      | $C_8 \geq 100Ah$   | 106.1% @12.5A   |
|     |  |      | $C_3 \geq 82.5Ah$  | 108.9% @27.5A   |
|     |  |      | $C_1 \geq 60.5Ah$  | 109.5% @60.5A   |
|     |  |      | $C_{0.25} \geq 38.5Ah$   | 110.4% @154A  |
| 12  | Charge retention during storage  | 6.12 | $\geq 70\%$  | 79.5%   |
| 13  | Float service with daily discharges 25°C, 80%                              | 6.13 | Total Cycle times $\geq 300$   | 335times  |
| 14  | Recharge behavior  | 6.14 | $R_{bf24h} \geq 90\%$  | 94.5%   |
|     |  |      | $R_{bf168h} \geq 98\%$   | 101.6%  |
| 15  | Service life at an operating temperature of 40°C all units to 0.8 $C_{rt}$ | 6.15 | - Brief duration exposure time $\geq 500d$<br>- Medium duration exposure time $\geq 750d$<br>- Long duration exposure time $\geq 1100d$<br>- Very long duration exposure time $\geq 1700d$ | 1808d (Very Long duration exposure time)  |
| 16  | Impact of a stress temperature of 60°C, 80%                                | 6.16 | - Brief duration exposure time $\geq 105d$<br>- Medium duration exposure time 175d<br>- Long duration exposure time $\geq 250d$<br>- Very long duration exposure time $\geq 350d$          | 400(Very long duration exposure time)   |
| 17  | Abusive over-discharge   | 6.17 | Unbalanced series over discharge $C_{aod} > 0.80$  | 0.88  |
|     |  |      | Cycle over discharge $C_{aoc} > 0.90$  | 0.96  |
| 18  | Thermal run away sensitivity   | 6.18 | Battery temperature change at 2.40VPC, the temperature after 168h  | 24.4°C  |
|     |  |      | Battery temperature change at 2.60VPC, the temperature after 168h  | 29.5°C  |



|    |  |      |   |   |
|----|--|------|---|---|
| 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 | $\Delta L = 0.05\%$                     |
| 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 — — —