



中国认可  
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检测  
TESTING  
CNAS L2885



# TEST REPORT

Report No. ....:	HST201803-1488-1-WT
Sample Description.....:	Valve Regulated Lead Acid Battery
Model.....:	See the Table 1
Assessment Category.:	Entrusted
Applicant.....:	

**Guangdong Huesent Testing & Inspection Technology Co., Ltd.**



## TEST REPORT

Sample Description	Valve Regulated Lead Acid Battery	Trademark	LEOCH
Model	See the Table 1	Specification	See the Table 1
Assessment Category	Entrusted	Sample Quantity	6 Pieces
Applicant	Leoch International Technology Limited	Sample Status	The samples are sound, intact and fit for test.
Sample Received Date	2018.03.30	Test Date	2018.03.30~2019.03.12
Manufacturer	Leoch International Technology Limited		
Address	5th Floor, Xinbaohui Bldg., Nanhai Blvd., Nanshan, Shenzhen, China.		
Factory	Leoch International Technology Limited		
Address	5th Floor, Xinbaohui Bldg., Nanhai Blvd., Nanshan, Shenzhen, China.		
Test address	Unit 102, 4th Building, HongJi e Valley International Enterprises Port, Tongji West Road, NantouTown,Zhongshan City, Guangdong.		
Test Items	See the Table 2		
Test standard	IEC 60896-21:2004 Stationary lead-acid batteries –Part 21:Valve regulated types – Methods of test IEC 60896-22:2004 Stationary lead-acid batteries –Part 22:Valve regulated types – Requirements		
Test Conclusion	The results conform to the requirements of standards with respect to the test items.		
Remarks	There are fifteen models (See theTable 1) for application, shown in this report, with the difference being the outer sizes and capacity. All of the tests were performed on 10OPzV1000 (2V1000AH). Replace the report HST201803-1488-WT.		
Tested by : Ben	Sign: <i>Ben</i>		
Reviewed by: John	Sign: <i>John</i>		
Approved by: Louis	Sign: <i>Louis</i>		



**Table 1:Models for application**

No.	Models	Specification
1	24OPzV3000	2V 3000Ah
2	20OPzV2500	2V 2500Ah
3	16OPzV2000	2V 2000Ah
4	12OPzV1500	2V 1500Ah
5	12OPzV1200	2V 1200Ah
6	10OPzV1000	2V 1000Ah
7	8OPzV800	2V 800Ah
8	6OPzV600	2V 600Ah
9	7OPzV490	2V 490Ah
10	6OPzV420	2V 420Ah
11	5OPzV350	2V 350Ah
12	6OPzV300	2V 300Ah
13	5OPzV250	2V 250Ah
14	4OPzV200	2V 200Ah
15	3OPzV150	2V 150Ah

**Table 2: Test Items**

Test Clause	Measures	Purpose
6.1	Gas emission	To determine the emitted gas volume
6.2	High current tolerance	To verify the adequacy of current conduction cross-sections
6.3	Short circuit current and d.c. internal resistance	To provide data for the sizing of fuses in the exterior circuit
6.4	Protection against internal ignition from external spark sources	To evaluate the adequacy of protective features
6.5	Protection against ground short propensity	To evaluate the adequacy of design features
6.6	Content and durability of required markings	To evaluate the quality of the markings and the content of the information
6.7	Material identification	To ensure the presence of material identification markings
6.8	Valve operation	To ensure the correct opening of safety valves
6.9	Flammability rating of materials	To verify the fire hazard class of battery materials
6.10	Intercell connector performance	To verify the maximum surface temperatures of the connectors during high rate discharges
6.11	Discharge capacity	To verify the available capacities at selected discharge rates or discharge durations.
6.12	Charge retention during storage	To provide storage duration data
6.13	Float service with daily discharge	To determine cyclic performance under float charge conditions
6.14	Recharge behaviour	To determine the recovery of capacity or autonomy time after a power outage
6.15	Service life at an operating temperature of 40 °C	To determine the operational life at elevated temperatures
6.16	Impact of a stress temperature of 55 °C or 60 °C	To determine the influence of high stress temperatures on cell or monobloc battery life
6.17	Abusive over-discharge	To determine the expected behaviour when excessive capacity is discharged
6.18	Thermal runaway sensitivity	To determine the expected times to establish a condition of escalating current and temperature
6.19	Low temperature sensitivity	To determine the sensitivity toward damage induced by electrolyte freezing
6.20	Dimensional stability at elevated internal pressure and temperature	To determine the propensity of the cell or monobloc battery to be deformed by internal pressure and at elevated temperature
6.21	Stability against mechanical abuse of units during installation	Determine the propensity of the cell or monobloc battery to fracture or leak when dropped.

## TEST RESULT

IEC 60896-21:2004, IEC 60896-22:2004			
Items	Requirement – Test	Result - Remark	Verdict
6.1	<p><b>Gas emission:</b></p> <p>The test methods are according to clause 6.1.1 to 6.1.14 which are stated in the standard IEC 60896-21</p> <p>Requirement and application: Measure gas volumes (At the rated float charge voltage; At 2,40 Vpc overcharge voltage conditions).</p> <p>State data for all applications: ml gas per cell, h and Ah at 20° or 25 °C; ml gas per cell, h and Ah at 20° or 25 °C.</p>	<p>At the rated float charge voltage  <math>U_{flo}=2.25V/(Ah \cdot h \cdot cell)</math> at 25° C:            1#: Ge=0,0015ml/(hour·Ah)            2#: Ge=0,0015ml/(hour·Ah)            3#: Ge=0,0014ml/(hour·Ah)</p> <p>At 2,40 Vpc overcharge voltage conditions at 25° C:            1#: Ge=0,0018ml/(hour·Ah)            2#: Ge=0,0018ml/(hour·Ah)            3#: Ge=0,0019ml/(hour·Ah)</p>	State the value
6.2	<p><b>High current tolerance:</b></p> <p>The test methods are according to clause 6.2.1 to 6.2.6 which are stated in the standard IEC 60896-21</p> <p>Requirement and application: Measure unit voltage, inspect and document the status of the top-lead and terminals of each unit after 30 s current flow.</p> <p>Pass for all applications: Voltage of unit &gt;2,0 Vpc;            Show evidence of no incipient melting or of no loss of electrical continuity after 30 s of high current flow (value to be stated).</p>	<p>It has no any damage after 30 s of high current flow.</p> <p>Voltage after open circuit for 5min:            1#: U=2.10V            2#: U=2.11V            3#: U=2.09V</p>	P
6.3	<p><b>Short circuit current and d.c. internal resistance:</b></p> <p>The test methods are according to clause 6.3.1 to 6.3.6 which are stated in the standard IEC 60896-21</p> <p>Requirement and application: Define prospective short-circuit value I<sub>sc</sub> and internal resistance R<sub>i</sub> of all units of a type range.</p> <p>State data for all applications: Short-circuit current (I<sub>sc</sub>) in A; Internal resistance (R<sub>i</sub>) in ohms.</p>	<p>1#: I<sub>sc</sub>=6072.7A            R<sub>i</sub> =0.41m Ω</p> <p>2#: I<sub>sc</sub>=6096.9A            R<sub>i</sub> =0.41m Ω</p> <p>3#: I<sub>sc</sub>=6011.9A            R<sub>i</sub> =0.42m Ω</p>	State the value

IEC 60896-21:2004, IEC 60896-22:2004			
Items	Requirement – Test	Result - Remark	Verdict
6.4	<b>Requirement for protection against internal ignition from external spark sources</b>	Batteries 1#, 2#, 3# both no rapid combustion, no explosion  Conformity	P
	The test methods are according to clause 6.4.1 to 6.4.6 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 7 in the standard IEC 60896-22		
6.5	<b>Requirement for Protection against ground short propensity</b>	Battery 1# no ground short, no leakage  Conformity	P
	Requirement and application: see table 8 in the standard IEC 60896-22		
	The test methods are according to clause 6.5.1 to 6.5.9 which are stated in the standard IEC 60896-21		
6.6	<b>Content and durability of required markings:</b>	Information remain readable after test and content meet requirement	P
	The durability of the marking shall be tested according to clause 1.7.13 of IEC 60950-1 and the content of marking shall meet the requirement of IEC 60896-22		
	Requirement and application: Expose information to chemicals. Pass all substances for all applications: Information shall remain readable after exposure to chemicals and remain in place		
	Requested information to be present for all applications.		
6.7	<b>Material identification:</b>	All the symbol remain readable; ABS plastic	P
	The test methods are according to clause 6.7.1 to 6.7.4 which are stated in the standard IEC 60896-21		
	Requirement and application: Inspect case and/or cover for ISO 1043-1 materials symbol. Expose to chemicals. Pass for all applications: ISO symbol present on the outside of the cover or/and case. Symbol shall remain readable after exposure to chemicals and remain in place. (NOTE If the material of the case differs from the material of the cover, then a material identification symbol should also be present on the case. Otherwise one symbol on the cover is sufficient.)		

IEC 60896-21:2004, IEC 60896-22:2004			
Items	Requirement – Test	Result - Remark	Verdict
6.8	<b>Valve operation:</b>	The valve adequate opening Gas release detected before and after stress temperature impact test Valve pressure: 20.1kpa~24.4kpa	P
	The test methods are according to clause 6.8.1 to 6.8.3 which are stated in the standard IEC 60896-21		
	Requirement and application: Overcharge units and detect gas flow from the valve. Pass for all applications: Gas release detected before and after stress temperature impact test		
6.9	<b>Flammability rating of materials:</b>	The flammability rating level for samples of thickness equivalent to that of case and cover: V-0	State the level
	The test methods are according to clause 6.9.1 to 6.9.4 which are stated in the standard IEC 60896-21		
	Requirement and application: Determine flammability rating of case and cover material. State data for all applications: State the flammability rating level for samples of thickness equivalent to that of case and cover		
6.10	<b>Intercell connector performance:</b>	The maximum temperature reached: 49.8°C	State the value
	The test methods are according to clause 6.9.1 to 6.9.4 which are stated in the standard IEC 60896-21		
	Requirement and application: Measure and report maximum intercell connector temperature reached. State data for all applications: State maximum temperature reached.		
6.11	<b>Discharge capacity:</b>	See the ANNEX B	P
	The test methods are according to clause 6.11.1 to 6.11.12 which are stated in the standard IEC 60896-21		
	Requirement and application: Determine actual capacity $C_a$ . $C_a$ to be at least X % of $C_{rt}$ with all units at all rates shown below: 10 h 1,80 Vpc; 8 h 1,75 Vpc; 3 h 1,70 Vpc; 1 h 1,60 Vpc; 0.25 h 1,60 Vpc. Comply for all applications: $C_a \geq 95 \% C_{rt}$ (NOTE The requirement of $C_a \geq 95 \% C_{rt}$ applies not to the average but to each individual capacity of each of the 6 units tested with a particular discharge rate.)		

IEC 60896-21:2004, IEC 60896-22:2004			
Items	Requirement – Test	Result - Remark	Verdict
6.12	<b>Charge retention during storage</b>	Charge retention factor $C_{rt}=88.6\%$	P
	The test methods are according to clause 6.11.1 to 6.11.12 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 16 in the standard IEC 60896-22		
6.13	<b>Float service with daily discharges</b>	Cycle number=336	-
	The test methods are according to clause 6.13.1 to 6.13.5 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 17 in the standard IEC 60896-22		
6.14	<b>Recharge behavior:</b>	1#: $Rbf_{24h} = 101.2\%$ $Rbf_{168h} = 102.3\%$  2#: $Rbf_{24h} = 100.8\%$ $Rbf_{168h} = 102.4\%$  3#: $Rbf_{24h} = 100.6\%$ $Rbf_{168h} = 101.8\%$	P
	The test methods are according to clause 6.14.1 to 6.14.12 which are stated in the standard IEC 60896-21		
	Requirement and application: Determine capacity after recharge; $Rbf_{24h}$ (24 h Recharge behaviour factor), $Rbf_{168h}$ (168 h Recharge behaviour factor). Comply for all applications: $\geq 90\%$ , $\geq 98\%$ (NOTE The requirement applies not to the average but to each of the individual tested units.)		
6.15	<b>service life at an operating temperature of 40 °C</b>	T=335 days $C_{3h\ rate} = 0.93 C_{rt}$	-
	The test methods are according to clause 6.15.1 to 6.15.5 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 19 in the standard IEC 60896-22		
6.16	<b>impact of a stress temperature of 55 °C or 60 °C</b>	At 60 °C: Duration exposure time: 342 days $C_{3h\ rate} = 0.86 C_{rt}$	-
	The test methods are according to clause 6.16.1 to 6.16.8 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 20 in the standard IEC 60896-22		
6.17	<b>Abusive over-discharge:</b>	Unbalanced string over-discharge capacity $C_{aod}$ : $C_{aod} = 0.96 C_{rt(3h\ rate)}$	P
	The test methods are according to clause 6.17.1 to 6.17.15 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 21 in the standard IEC 60896-22	Cyclic over-discharge capacity $C_{aoc}$ : $C_{aoc} = 0.99 C_{rt(3h\ rate)}$	



IEC 60896-21:2004, IEC 60896-22:2004			
Items	Requirement – Test	Result - Remark	Verdict
6.18	<b>information on thermal runaway sensitivity</b>	Ultimate temperature after 168h at 2,45 Vpc: $T_a=37.8\text{ }^\circ\text{C}$ Ultimate temperature after 24h at 2,60 Vpc: $T_b=39.6\text{ }^\circ\text{C}$	P
	The test methods are according to clause 6.18.1 to 6.18.14 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 22 in the standard IEC 60896-22		
6.19	<b>impact of low temperature service on capacity</b>	$C_{als} = 1.01 C_{rt(3h\ rate)}$ No mechanical damages	P
	The test methods are according to clause 6.19.1 to 6.19.13 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 23 in the standard IEC 60896-22		
6.20	<b>dimensional stability at elevated internal pressures and temperatures</b>	Change in: Length:0,49% +1.0mm Width:0,51% +1.0mm	P
	The test methods are according to clause 6.20.1 to 6.20.6 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 24 in the standard IEC 60896-22		
6.21	<b>stability against mechanical abuse of units during installation</b>	No leakage, No broken	P
	The test methods are according to clause 6.21.1 to 6.21.6 which are stated in the standard IEC 60896-21		
	Requirement and application: see table 25 in the standard IEC 60896-22		

## TEST RESULT

### ANNEX A: 6.6-Requested markings information to be present

#### Technical information to be present

Polarity sign at the positive terminal(s) with a + symbol radius of at least 6 mm	6.5mm
Manufacturer and/or vendor name	Leoch International Technology Limited
Country of origin of unit	Made in China
Type designation of unit	10OPzV1000
At least one rated capacity and its final voltage in Vpc or V per unit at a rate listed in 6.11 of IEC 60896-2-1	1000Ah(End voltage 1.8Vpc 25°C)
Rated temperature (20 °C or 25 °C) for the capacity value	25°C
Float voltage in Vpc or V per unit at a rated temperature of 20 °C and/or 25 °C	2.25/Cell of 25°C
Date of manufacture (see Note 1 below) in clear unequivocal mm.yyyy format	-

#### ISO warning symbols to be present with 11 mm diameter minimum size and in two contrasting colours (See Note 2 and 3 below)

Warning	P
Electrical danger	P
No open fires and sparks	P
Wear eye protection	P
Read instructions	P

#### Environmental protection and recycling symbols to be present

Recycling symbol	P
Crossed out waste bin	P

NOTE 1 For the purpose of this standard the “date of manufacture” is defined as the date of final inspection of the units in the factory of origin.

NOTE 2 When the physical dimensions of the units do not allow to apply the symbols on the unit itself then a separate label to be affixed near the battery or on the battery operating instructions is acceptable.

NOTE 3 The background colour is considered to be one colour.

## TEST RESULT

ANNEX B: 6.11-Discharge capacity(100PzV1000)											
Capacity Sample No.	C <sub>rt</sub> =1000Ah		C <sub>rt</sub> =865Ah		C <sub>rt</sub> =762Ah		C <sub>rt</sub> =568Ah		C <sub>rt</sub> =239Ah		Remark
	C <sub>10</sub> (Ah)	%of C <sub>rt</sub>	C <sub>8</sub> (Ah)	%of C <sub>rt</sub>	C <sub>3</sub> (Ah)	%of C <sub>rt</sub>	C <sub>1</sub> (Ah)	%of C <sub>rt</sub>	C <sub>0.25</sub> (Ah)	%of C <sub>rt</sub>	
1#	1105.8	110.5	942.9	109.0	822.2	107.9	610.8	107.5	262.4	109.7	25°C C <sub>a</sub> ≥95%C <sub>rt</sub>
2#	1106.7	110.6	943.8	109.1	821.8	107.8	611.2	107.6	261.6	109.4	
3#	1107.1	110.7	945.6	109.3	822.5	107.9	612.4	107.8	262.7	109.9	
4#	1106.4	110.6	944.3	109.1	822.9	108.0	610.5	107.4	261.8	109.5	
5#	1107.5	110.7	945.1	109.2	823.4	108.1	611.7	107.6	263.4	110.2	
6#	1106.2	110.6	944.5	109.1	823.1	108.0	612.3	107.7	262.6	109.8	

**Photo(s) of the tested samples**

10OPzV1000 (2V1000AH):



10OPzV1000 (2V1000AH):



**-- End of Report --**

## Report Statement

- 1.This test report is invalid if altered, additions and deletions.
- 2.This test report is responsible for tested samples only .
- 3.Objections to the test report must be submitted to Guangdong Huesent Testing & Inspection Technology Co., Ltd. within 15 days.
- 4.The test report is invalid without the signatures of tester, reviewer ,approver ,and official stamp of test unit.
- 5.Without permission of Guangdong Huesent Testing & Inspection Technology Co., Ltd., This report is not permitted to be duplicated in extracts.
- 6.“P”=Pass=Test item conform to the requirement  
“F”= Fail=Test item not conform to the requirement  
“N”= Not Applicable =Test item Not Applicable to the test object