
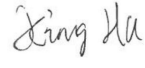







<b>IECEx TEST REPORT EN 60079-11</b> <b>Explosive atmospheres –</b> <b>Part 11: Equipment protection by intrinsic safety "i"</b>	
<b>Report Number</b> .....:	19ZCTS0920011LR
<b>Tested by (+ signature)</b> .....:	Kevin Yang 
<b>Approved by (+ signature)</b> .....	King Hu 
<b>Date of issue</b> .....	Oct.08, 2019
	
<b>Testing laboratory</b>	
<b>Testing Laboratory Name</b> .....	Shenzhen ZCT Technology Co.,Ltd.
<b>Address</b> .....:	3/F., Building 5, Hongsheng Industrial Zone, Bao'an Road, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China.
<b>Applicant's name</b> .....:	Titus Battery
<b>Address</b> .....:	291 N.Hubbards Lane,Suite 172-120,Louisville,KY 40207,USA
<b>Manufacturer's name</b> .....:	Wuhan Voltec Energy Sources Co., Ltd
<b>Address</b> .....:	No.231, Xing San Road, Han Nan District, WuHan, HuBei
<b>Factory's name</b> .....:	Wuhan Voltec Energy Sources Co., Ltd
<b>Address</b> .....:	No.231, Xing San Road, Han Nan District, WuHan, HuBei
<b>Standard</b> .....:	EN 60079-11:2012
<b>Test procedure</b> .....:	CE
<b>Non-standard test method</b> .....:	N/A
<b>Test item description</b> .....:	3.6V Primary Lithium Thionyl Chloride High Energy
<b>Trade Mark</b> .....:	N/A
<b>Model/Type reference</b> .....:	ER18505
<b>Ratings</b> .....:	 II M2 G Ex deia IIC T4  II M2 D Ex tD A21 T135° C

Copy of marking plate	
<p>3.6V Primary Lithium Thionyl Chloride High Energy</p> <p> II M2 G Ex deia IIC T4</p> <p> II M2 D Ex tD A21 T135° C</p> <p>Model: ER14250                  Batch No.:                  Using ambient temperature:-55~85°C                  Input:5VDC 50Hz 1A                  Output:DC3.6V 4A                  Titus Battery 291 N.Hubbards Lane,Suite                  172-120,Louisville,KY 40207,USA</p>	ER18505
<p><b>Summary of testing:</b>                  Test performed in accordance with all of the clauses of according EN 60079-11</p>	

**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** .....

Date of receipt of test item ..... : Sept.18, 2019

Date(s) of performance of test ..... : Sept.18, 2019 to Oct.08, 2019

**General remarks:**

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(see Enclosure #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma (point) is used as the decimal separator.

Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.

This test report includes:

Annex I: Photo documentation, **2** pages

**General product information:**

3.6V Primary Lithium Thionyl Chloride High Energy,  
Models:/

EN 60079-11			
Cl.	Requirement – Test	Result	Verdict
1	SCOPE		
2	NORMATIVE REFERENCES		
3	DEFINITIONS		
4	GROUPING AND CLASSIFICATION		Pass
<b>5</b>	<b>LEVELS OF PROTECTION AND IGNITION COMPLIANCE</b>		
5.1	General	Level of protection: "ib"	Pass
<b>5.2, 5.3, 5.4</b>	<b>Level of protection</b>		Pass
5.5	Spark ignition compliance	Refer to Appendix A.2 for details.	Pass
5.6	Thermal ignition compliance		
5.6.1	General	Refer to Appendix A.3 for details.	Pass
5.6.2	Temperature for small components	Refer to Appendix A.3.1 for details.	Pass
5.6.3	Wiring within apparatus	Refer to Appendix A.3.2 for details.	Pass
5.6.4	Tracks on printed circuit boards	Refer to Appendix A.3.3 for details.	Pass
5.7	Simple apparatus	The equipment is not a simple apparatus.	Pass
6	APPARATUS CONSTRUCTION		
6.1	Enclosures	Non-metallic enclosure and its material is PC(Black). Surface resistance test was done according to Cl. 26.13 of IEC60079-0:2007. The enclosure has a degree of protection of IP66.	
6.1.1	Apparatus complying with Table 5	It complies with Table 5.	Pass
6.1.2	Apparatus complying with Annex F	Annex F is not used.	N/A
6.1			N/A
6.2	Facilities for connection of external circuits	No facilities for connection of external circuits.	N/A

EN 60079-11			
Cl.	Requirement – Test	Result	Verdict
6.2.1	Terminals	No terminals.	N/A
6.2.2	Plugs and sockets	No plugs or sockets.	N/A
6.2.3	Determination of maximum external inductance to resistance ratio (Lo/Ro) for resistance limited power source	Not involved.	N/A
6.2.4	Permanently connected cable	No cable for external connection.	N/A
6.3	Separation distances	Comply with the requirements.	Pass
6.3.1	Separation of conductive parts	The distance of the battery protection plate was measured by image measuring instrument.	Pass
6.3.1.1	Distances according to Table 5	The battery protection board of 18650-10S9P is completely encapsulated, separation distance through casting compound is 0.582mm, so it complies with Table 5.	Pass
		The creepage distance under coating of LED driving board is 0.586mm, so it complies with Table 5.	N/A
6.3.1.2	Distances according to Annex F	Annex F is not used.	N/A
6.3.2	Voltage between conductive parts	Correspond with the requirements of 6.3.2.	Pass
6.3.3	Clearance	No insulating partitions with more than 0.9mm thickness or conforming with 10.6.3,present.	N/A

EN 60079-11			
Cl.	Requirement – Test	Result	Verdict
6.3.4	Separation distances through casting compound	The fuses and battery protection board of AT-1280 are encapsulated , the minimum separation distance between encapsulated conductive components and the free surface of the casting compound is a minimum of 1mm.	Pass
6.3.5	Separation distances through solid insulation	No solid insulation.	N/A
6.3.6	Composite separations	No composite separations given that need evaluation.	N/A
6.3.7	Creepage distance	All creepage distances are according to table 5.	Pass
6.3.8	Distance under coating	The board is completely under coating.	Pass
6.3.9	Requirements for assembled printed circuit boards	Comply with the requirements.	Pass
6.3.10	Separation by earth screens	No earth screens.	N/A
6.3.11	Internal wiring	No internal wiring that needs separations.	N/A
6.3.12	Dielectric strength requirement	No metallic enclosure and no necessary.	N/A
6.3.13	Relays Protection Against Polarity	No relays.	N/A
6.4	Reversal	No diode necessary.	N/A
6.5	Earth conductors, connections and terminals	No earth conductors.	N/A
6.6	Encapsulation	The fuses and battery protection board of are completely encapsulated. The encapsulating material is ET-5 Room Temperature Solidification Pasty Adhesive and its operating temperature is -25°C~145°C.	Pass
7	COMPONENTS ON WHICH INTRINSIC SAFETY DEPENDS		

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Cl.	Requirement – Test	Result	Verdict
7.1	Rating of components	Refer to Appendix A.4 for details.	Pass
7.2	Connectors for internal connections, plug-in cards and components	The intrinsic safety parts have no connectors.	N/A
7.3	Fuses	F1 and F2, manufactured by Skytex, model are F400mAL250VP and F1000mAL250VP, rating are 0.4A and 1A.	Pass
7.4	Primary and secondary cells and batteries	The intrinsic safety parts have no cells and batteries.	N/A
7.4.1	General	The intrinsic safety parts have no cells and batteries.	N/A
7.4.2	Electrolyte leakage and ventilation	The intrinsic safety parts have no cells and batteries.	N/A
7.4.3	Cell voltages	The intrinsic safety parts have no cells and batteries.	N/A
7.4.4	Internal resistance of cell or battery External contacts for charging batteries 7.4.9	The intrinsic safety parts have no cells and batteries.	Pass
7.4.5	Batteries in apparatus protected by other means of protection	The intrinsic safety parts have no cells and batteries.	N/A
7.4.6	Batteries used and replaced in explosive gas atmospheres	The intrinsic safety parts have no cells and batteries.	N/A
7.4.7	Batteries used but not replaced in explosive gas atmospheres	The intrinsic safety parts have no cells and batteries.	N/A
7.4.8		There are four series blocking diodes D1~D4(1N5400) placed in the battery protection circuit to prevent the batteries from delivering energy to the external contacts.	N/A
7.4.9	Battery construction	The intrinsic safety parts have no cells and batteries.	
7.5	Semiconductors	No semiconductors.	N/A

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Cl.	Requirement – Test	Result	Verdict
7.5.1	Transient effects	Transient effects are not expected.	N/A
7.5.2	Shunt voltage limiters	No shunt voltage limiters used.	N/A
7.5.3	Series current limiters	No series current limiters used.	N/A
7.6	Failure of components, connections and separations	“ib” protection level and the components are	Pass
7.7	Piezo-electric	No piezo-electric devices	N/A
7.8	Electrochemical cells for the detection of gases	No electrochemical cells.	N/A
8	INFALLIBLE COMPONENTS, INFALLIBLE ASSEMBLIES OF COMPONENTS AND INFALLIBLE CONNECTIONS ON WHICH INTRINSIC SAFETY DEPENDS		
8.1	Mains transformers		N/A
8.1.1	Protective measures	No transformers.	N/A
8.1.2	Transformer construction	No transformers.	N/A
8.1.3	Transformer type tests	No transformers.	N/A
8.1.4	Routine test of mains transformers	No transformers.	N/A
8.2	Transformers other than mains transformers	No transformers.	N/A
8.3	Infallible windings	Not involved.	N/A
8.3.1	Damping windings	The current-limiting resistor R6 and R7 is rated in accordance with the requirements of 7.1.	N/A
8.3.2	Inductors made by insulated conductors Current-limiting resistors		N/A
8.4	Current-limiting resistors	The current-limiting resistor R6 and R7 is rated in accordance with the requirement of 7.1	Pass
8.5	General Blocking capacitors	No blocking capacitors.	N/A
8.6	Shunt safety assemblies	Not involved.	N/A
8.6.1	General	Not involved.	N/A
8.6.2	Safety shunts		N/A



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Cl.	Requirement – Test	Result	Verdict
8.6.3	Shunt voltage limiters		N/A
8.7	Wiring, printed circuit board tracks, and connections		N/A
8.8	Galvanically separating components	No galvanic separating components.	N/A
8.8.1	General		N/A
8.8.2	Isolating components between intrinsically safe and non-intrinsically safe circuits		N/A
8.8.3	Isolating components between separate intrinsically safe circuits		N/A
9	Diode Safety Barriers		N/A
9.1	General	No diode safety barrier.	N/A
9.2	Mounting	No diode safety barrier.	N/A
9.2.1	Construction	No diode safety barrier.	N/A
9.2.2	Facilities for connection to earth	No diode safety barrier.	N/A
9.2.3 10	Protection of components TYPE VERIFICATIONS AND TYPE TESTS	No diode safety barrier.	N/A
10.1	General	Refer to Appendix A.2 for details.	N/A
10.1.1	Spark ignition test	The circuit meets the requirements of the curves Fig.A1to A6, so it is free for spark test.	N/A
10.1.2	Spark test apparatus		N/A
10.1.3, 10.1.3.1, 10.1.3.2	Test gas mixtures and spark test apparatus calibration current		N/A
10.1.4, 10.1.4.1, 10.1.4.2	Tests with the spark test apparatus – circuit test, safety factors		N/A
10.1.5	Testing considerations		
10.1.5.1	General	Refer to Appendix A.2.4 for details.	N/A
10.1.5.2	Circuits with both inductance and capacitance	Refer to Appendix A.2.5 for details.	N/A
10.1.5.3	Results of spark test		N/A

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Cl.	Requirement – Test	Result	Verdict
10.1.5.4	Circuits using shunt short-circuit (crowbar) protection		N/A
10.2	Temperature tests	The tests were carried out in accordance with 10.2 and the result complies with T4. See annex B.1.	Pass
10.3	Dielectric strength tests	No dielectric strength tests necessary.	N/A
10.4	Determination of parameters of loosely specified components	No loosely specified components.	N/A
10.5	Tests for cells and batteries	The intrinsic safety parts have no cells and batteries.	
10.5.1	General	The intrinsic safety parts have no cells and batteries.	N/A
10.5.2	Electrolyte leakage test for cells and batteries		N/A
10.5.3	Spark ignition and surface temperature of cells and batteries		N/A
10.5.4	Battery container pressure tests		N/A
10.6	Mechanical tests	There is no free surface of casting compound.	N/A
10.6.1	Casting compound	There is no free surface of casting compound	N/A
10.6.2	Sealing of components before encapsulation	Encapsulation can not enter the interior of component and affect safety.	N/A
10.6.3	Partitions	No partitions.	N/A
10.7	Tests for apparatus containing piezoelectric devices	No piezoelectric devices.	N/A
10.8	Type tests for diode safety barriers and safety shunts	No diode safety barriers.	
10.9	Cable pull test	No cable.	N/A
10.10	Transformer tests	No transformer.	N/A
11	ROUTINE VERIFICATIONS AND TESTS		N/A
11.1	Completed barriers		N/A
11.1.1	Routine tests for diode safety barriers		N/A
11.1.2	Diodes for 2-diode "ia" barriers		N/A

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Cl.	Requirement – Test	Result	Verdict
11.2	Routine tests for infallible transformers		N/A
12	MARKING		
12.1	General	Ex e ib II C T4 Gb	Pass
12.2	Marking of connection facilities	No connection facilities.	N/A
12.3	Warning markings		N/A
13	DOCUMENTATION	The documentation is complete, includes General assembly drawing, schematic diagram and PCB diagram, material quality report of ET-5 Room Temperature Solidification Pasty Adhesive and Operating instruction of encapsulation etc.	Pass

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Cl.	Requirement – Test	Result	Verdict

**APPENDIX A: Additional construction remarks**

4.3	TABLE: clearance distance measurements		
Clearance (cl) between circuit parts:	$U_{r.m.s.}$ a.c. or d.c. (V)	Required cl (mm)	Measured cl (mm)
Clearance between poles of capacitance	No greater than 6VDC	0.5	23.2
Clearance of PCB	No greater than 6VDC	0.5 (under the compound)	0.54

4.3	TABLE: clearance distance measurements		
Creepage (dcr) distance between circuit parts:	$U_{r.m.s.}$ a.c. or d.c. (V)	Required dcr (mm)	Measured dcr (mm)

4.4	TABLE: creepage distance measurements		

6.1	TABLE: dielectric strength tests		
test voltage applied between:	test voltage (V) a.c. / d.c.	breakdown Yes / No	
Between circuit and enclosure	AC500V	No	
Between inlet and outlet, When the power supply is cut off.	AC500V	No	

- End of Test Report -