

# TEST REPORT

# SABS

Your Ref. : Order 899853GN  
 Our Ref. : TEST LAB  
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 Date : 16 March 2009  
 Page : 1 of 8

Saab Grintek Technologies (Pty) Ltd  
 Attention: Mr N Truter  
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 SWARTKOPS  
 0051

## Final Test Report 2720/TC1D

The sample complies with the requirements of the Telkom tender, and the relevant clauses of SANS IEC 60896-21/22:2004, against which they were tested.

Manufacturer	SEC Battery Technology Co	
Place of manufacturing	China	
Product name		
Product model range	TLAM	
Product comprising the above model range		
Product tested	2TLAM1200	
<b>Performance information</b>		
<b>Product safe operation in Service</b>		<b>IEC 60896-21 test clause result</b>
6.1 Gas emission (at 2,27 Vpc and 2,4 Vpc)	0,007ml/c/h/Ah	0,0094 ml/c/h/Ah
6.2 High current tolerance	> 2 Vpc measured after 5 min on open circuit	
6.3 Short circuit current and d.c. internal resistance	$I_{sc} = 10\ 700A$ ; $R_i = 0,2\ m\Omega$	
6.4 Internal ignition from external spark source	Report from manufacturer accepted	
6.5 Protection against ground short propensity	Comply	
6.6 Content and durability of required markings	Comply	
6.7 Material identification	Report from manufacturer accepted.	
6.8 Valve operation	Before: Comply	After: Comply
6.9 Flammability rating of materials	Case: V0	Cover: V0
6.10 Inter-cell connector performance	< 60°C when tested at 1 000 A	
<b>Product performance in service</b>		<b>IEC 60896-21 test clause result</b>
6.11 Discharge capacity	Not required	
6.12 Charge retention during storage	Not required	
6.13 Float service with daily discharge	Cycles: 164 cycles comply to Telkom requirements to date	
6.14 Recharge behaviour	Not required	
<b>Product durability in service</b>		<b>IEC 60896-21 test clause result</b>
6.15 Float service life at 40°C	Not required	
6.16 Impact of stress temperature at 60°C	240 days completed. Capacity > 100% of rated	
6.17 Abusive over-discharge	Not required	
6.18 Thermal runaway sensitivity	Not required	
6.19 Low temperature sensitivity	Not required	
6.20 Dimensional stability at elevated internal pressure and temperature	Not required	
6.21 Stability against mechanical abuse of units during installation	Not required	

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This test was performed by SABS Commercial (Pty) Ltd. This report and the test results relate only to the specific sample(s) identified herein. They do not imply SABS approval of the quality and/or performance of the item(s) in question and the test results do not apply to any similar item that has not been tested. (Refer also to the complete conditions printed on the back of this page.)



## 1 Description of functional characteristics required for standard.

Tables 1-3 describe the requirements for compliance to IEC standard 60896:21/2 – 2004 and IEC 61427.

**Table 1. Safe operation characteristics**

Test section no.	Measurement	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 dc 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 and content of information markings.
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	Inter-cell connector performance.	To verify the maximum surface temperatures of connectors during high rate discharges.

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Hierdie verslag is van toepassing slegs op die getoetste monsters en word uitgereik behoudens die voorwaardes op die keersy van bladsy 1 gedruk. Dit beteken nie dat die Suid-Afrikaanse Buro vir Standaarde die kwaliteit en/of werkverrigting van die getoetste artikel goedkeur nie. Dit verleen ook nie die reg om die Standaardmerk te gebruik nie.

**Table 2. Performance characteristics**

Test section no.	Measurement	Purpose
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 discharges.	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.

**Table 3. Durability characteristics**

Test section no.	Measurement	Purpose
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 @ 60°C.	To determine the influence of high stress temperatures on cell or mono-bloc battery life.
6.17	Abusive over-discharge.	To determine the expected behavior 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 towards damage induced by electrolyte freezing.
6.20	Dimensional stability at elevated internal pressure and temperature.	To determine the propensity of the cell or mono-bloc battery to be deformed by internal pressure.
6.21	Stability against mechanical abuse of unit during installation.	To determine the propensity of the cell or mono-bloc battery to fracture or leak when dropped.

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## 2. Summary of battery performance

### 2.1. Battery selection.

At the request of the sponsor, the batteries were tested for compliance to Telkom tender requirements; using IEC 60896-21/2 : 2004 (SANS IEC 6089621/2:2004).

### 2.2. Safe operation characteristics.

**(Note: For detailed results refer to Section 3 of this report)**

#### Sub Section 6.1. Gas emission.

Completed.

#### Sub section 6.2. High-current tolerance.

Not tested.

#### Test section 6.3. Short-circuit current and DC internal resistance.

Completed.

#### Test section 6.4. Protection against internal ignition from external spark sources.

Test report from manufacturer accepted.

#### Test section 6.5. Protection against ground short propensity.

This test was subcontracted to Gerotek Test Facilities. See report attached.

#### Test section 6.6. Content and durability of required markings.

This test was subcontracted to Gerotek Test Facilities. See report attached.

#### Test section 6.7. Material identification.

Report from manufacturer accepted.

#### Test section 6.8. Valve operation.

The batteries complied with the requirements of this subsection.

#### Test section 6.9. Flammability rating of materials.

Completed.

#### Test section 6.10. Inter-cell connector performance.

When tested at a current of 1 000A, the cells comply with the requirements of this subsection.

### 2.3. Performance characteristics.

#### Test section 6.11. Discharge capacity.

Not tested, however, all the batteries were subjected to a three (3) hour capacity check, as this result is required for further testing

All capacities of all modules evaluated according to this test section were above 95% of the nominal value.

#### Test section 6.12. Charge retention during storage.

Not tested

#### Test section 6.13. Float service with daily discharges.

Completed 164 cycles.

#### Test section 6.14. Recharge behaviour.

Not tested.

### 2.4. Durability requirements.

#### Test section 6.15. Service life at an operating temperature of 40°C.

Not tested.

#### Test section 6.16. Impact of a stress temperature of 60°C.

The cells completed 240 days with capacities above 80% of rated capacity (C<sub>3</sub>).

The batteries complied with the requirements of Telkom tender.

Note: Some leakage occurred during the test.

#### Test section 6.17. Abusive over-discharge.

Not tested.

#### Test section 6.18. Thermal runaway sensitivity.

Not tested

#### Test section 6.19. Low temperature sensitivity.

Not tested.

#### Test section 6.20. Dimensional stability at elevated internal pressure and temperature.

Not tested.

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Test section 6.21. Stability against mechanical abuse of units during installation.

Not tested.

**3. Detailed results****3.1. Safe operation characteristics**Test section 6.1. Gas emission.

The volume of gas emitted from each cell under standard and elevated float condition is given below.

Table 4. Gas released from batteries under float duty  
(Total corrected volume (ml) of gas -Vn - indicated in brackets)

Gas emission - Ge - (ml/cell/h/Ah) (25°C)				
1st period 168 h (2.27 V/cell)	2nd period 168 h (2.27 V/cell)	3rd period 168 h (2.27 V/cell)	4th period 168 h (2.27 V/cell)	5th period 48 h (2.4 V/cell)
0,0019 (Vn = 390)	0,0018 (Vn = 370)	0,0017 (Vn = 350)	0,0016 (Vn = 331)	0,009 (Vn = 520)

Sub section 6.2. High-current tolerance.

The voltage measured after 5 min at open circuit > 2Vpc (2,11V)

Results obtained from test conducted in Sub Section 4.10 Inter-cell Connector Performance test

Sub Section 6.3. Short-circuit current and d.c. internal resistance

Calculated short-circuit current  $I_{sc} = 10\ 200A$

Calculated internal resistance  $R_i = 0,2\ m\Omega$

The above values were obtained from each of the 3 cells tested.

Sub Section 6.4. Protection against internal ignition from external spark sources.

Test report from manufacturer accepted.

Test section 6.5. Protection against ground short propensity.

Battery complies with the requirements of this subsection.

(See also Gerotek test report)

Test section 6.6. Content and durability of required markings.

Battery complies with the requirements of this subsection.

(See also Gerotek test report)

Test section 6.7. Material identification.

Report from manufacturer accepted.

Test section 6.8. Valve operation.

The cells were submerged in water, on each opening of the individual valves, air bubbles were noticed, indicating operation of valves.

Test section 6.9. Flammability rating of materials.

Material rated 'V0' for case and HB0 for the lid.

Test section 6.10. Inter-cell connector performance.

No connectors supplied, batteries are used as 6V mono blocks

**3.2. Performance characteristics.**Test section 6.11. Discharge capacity.

The cells complied with the requirements of this subsection.

Minimum requirement:  $C_d \geq 95\% C_n$

Test section 6.12. Charge retention during storage.

Not tested

Test section 6.13. Float service with daily discharges.

The cells complied with the requirements of this subsection.

The cells complete 164 cycles.

Test section 6.14. Recharge behaviour.

Not tested

**3.3. Durability characteristics.**Test section 6.15. Service life at an operating temperature of 40°C.

Not tested.

Test section 6.16. Impact of a stress temperature of 60°C.Termination values =  $(0,8 C_n) 730,0Ah$ 

Capacities of cells operating under float conditions at 60°C.

Capacity after...	Measured Capacity, Ah
30 days	1238
60 days	1229
90 days	1172
120 days	971
150 days	894
180 days	873
240 days	836

The cells started leaking acid, around the terminal posts, after approximately 21 days and continued to leak until 74 days. Total amount of acid leakage was not measure.

The batteries complied with the requirements of Telkom tender.

Test section 6.17. Abusive over-discharge.

Not tested.

Test section 6.18. Thermal runaway sensitivity.

Not tested.

Test section 6.19. Low temperature sensitivity.

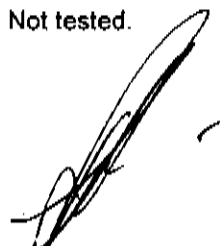
Not tested.

Test section 6.20. Dimensional stability at elevated internal pressure and temperature.

Not tested

Test section 6.21. Stability against mechanical abuse of units during installation.

Not tested.



L RADEMEYER  
TESTED BY AND  
AUTHORISED TECHNICAL SIGNATORY



MJ BOND  
REGIONAL MANAGER  
EAST LONDON

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