

TEST REPORT

SABS

Your Ref. : Order 899853GN
 Our Ref. : TEST LAB
 Enquiries : L Rademeyer
 Tel. : +27 43 736-2351
 Date : 3 November April
 Page : 1 of 10

Saab Grintek Technologies (Pty) Ltd
 Attention: Mr N Truter
 PO Box 11212
 SWARTKOPS
 0051

CONCLUSION

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.

Final Test Report 2720/TC01A

Manufacturer	SEC Battery Technology Co	
Place of manufacturing	China	
Product name	Microlyte Red Top	
Product model range	MRT	
Product comprising the above model range	6-12 MRT VRLA	
Product tested	12MRT3.3	
Performance information		
Product safe operation in Service		IEC 60896-21 test clause result
6.1 Gas emission (at 2.27 Vpc and 2.4 Vpc)	mIc/h/Ah 0,00011	mIc/h/Ah 0,00014
6.2 High current tolerance	> 2,0 Vpc	
6.3 Short circuit current and d.c. internal resistance	I _{sc} = 126 A; R _i = 99,3mΩ	
6.4 Internal ignition from external spark source	Report of manufacturer accepted	
6.5 Protection against ground short propensity	See Gerotek test report	
6.6 Content and durability of required markings		
6.7 Material identification	Report from manufacturer accepted.	
6.8 Valve operation	Before: Pass	After: Pass
6.9 Flammability rating of materials	Case:	Cover:
6.10 Inter-cell connector performance	Mono-block batteries test not required	
Product performance in service		IEC 60896-21 test clause result
6.11 Discharge capacity	Not required	
6.12 Charge retention during storage	Not required	
6.13 Float service with daily discharge	116 cycles completed. Comply to Telkom requirements	
6.14 Recharge behaviour	Not required	
Product durability in service		IEC 60896-21 test clause result
6.15 Float service life at 40°C	Not required	
6.16 Impact of stress temperature at 60°C	120 days completed comply to Telkom requirements	
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	

SABS Commercial (Pty) Ltd, Battery Technology, 1 Teichmann Place (off Chester road), Sunnyridge, East London.
 PO Box 5156, Greenfields East London 5208. Tel: +27 (0) 43 736 2351/2/3. Fax: +27 (0) 43 736 1175

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.

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.

This report relates only to the samples tested and is issued subject to the conditions printed on the back of Page 1. It does not imply approval by the South African Bureau of Standards of the quality and/or performance of the commodity that has been tested. It does not authorise the use of the Standardisation Mark.

Hierdie verslag is van toepassing slegs op die getoetste monstere 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.

This report relates only to the samples tested and is issued subject to the conditions printed on the back of Page 1. It does not imply approval by the South African Bureau of Standards of the quality and/or performance of the commodity that has been tested. It does not authorise the use of the Standardisation Mark.

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.

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.

Complete - within normal limits.

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.

Not tested

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.

Not tested

Test section 6.8. Valve operation.

The batteries complied with the requirements of this subsection.

Test section 6.9. Flammability rating of materials.

Not tested.

Test section 6.10. Inter-cell connector performance.

When tested at maximum recommended current, the batteries 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.

Test in progress, 116 cycles completed.

The battery complies with the requirements of the Telkom tender

Test section 6.14. Recharge behavior.

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.

Batteries completed 120 days with capacities above 80% of rated capacity (C_3).

The batteries complied with the requirements of the 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.

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

The volume of gas emitted from the battery under standard float condition is given below. The valves of the batteries were connected in series. One outlet of the first battery was blocked while the open outlet of the third battery was connected, via a rubber tube, to the collection vessel.

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)
0,0001 (Vn = 6,05)	0,0001 (Vn = 6,05)	0,0001 (Vn = 6,11)	0,0001 (Vn = 6,20)	0,00014 (Vn = 8,47)

Sub section 6.2. High-current tolerance.

The voltage measured after 5 min at open circuit > 2Vpc (12,78V)

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 $I_{sc} = 126A$
Calculated internal resistance $R_i = 99,3 m\Omega$

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

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

Not tested

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.

Not tested

Test section 6.8. Valve operation.

The batteries 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.

Not tested.

Test section 6.10. Inter-cell connector performance.

Monoblock batteries, test not required.

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

The batteries complied with the requirements of this subsection.

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

Test section 6.12. Charge retention during storage.

Not tested

Test section 6.13. Float service with daily discharges.

The batteries complied with the 'reliable mains power' requirements of this subsection.

Minimum requirement: 50 cycles

Measured value: 116 cycles

Test section 6.14. Recharge behavior.

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 = $(0,8 C_R) 2Ah$

Capacities of batteries, after 30 days, operating under float conditions at 60°C.

Capacity no after	Battery Number		
	#1, Ah (% of rated)	#2, Ah (% of rated)	#3, Ah (% of rated)
30 days	2,72 (108)	2,66 (106)	2,71 (108)
60 days	2,76 (110)	2,70 (107)	2,84 (113)
90 days	2,76 (110)	2,71 (108)	2,82 (112)
120 days	2,83 (112)	2,81 (112)	2,89 (115)

The batteries complied with the requirements of the 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.



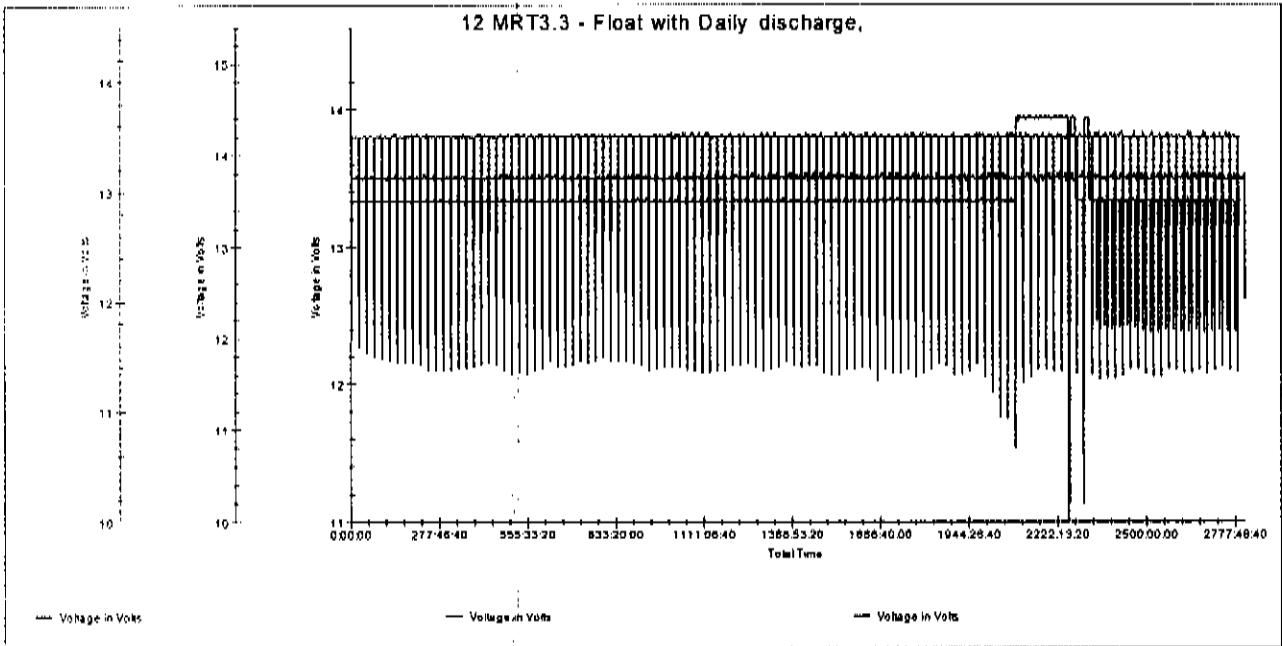
L RADEMEYER
TESTED BY AND
AUTHORISED TECHNICAL SIGNATORY



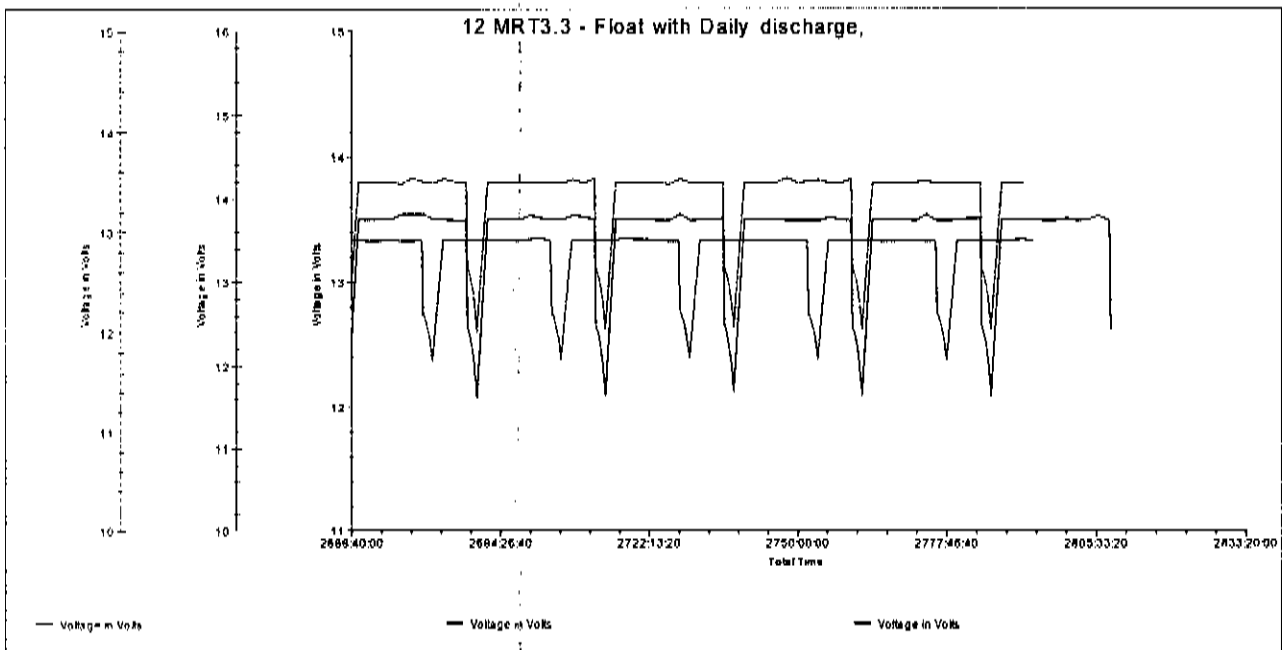
MJ BOND
REGIONAL MANAGER
EAST LONDON

This report relates only to the samples tested and is issued subject to the conditions printed on the back of Page 1. It does not imply approval by the South African Bureau of Standards of the quality and/or performance of the commodity that has been tested. It does not authorise the use of the Standardisation Mark.

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.



One battery (Red curve) reached the cut-off voltage during the discharge step. After conducting a capacity test the battery was returned to the cycle tester and the test continued.



Expanded view of the last 5 cycles

Valve operation after Temperature stress test.

