

TABLE V
Control Sample Test
 (Ref Para 13.2)

Srl No.	Classification of Test	Title of Test	Test Clause. No.
(i)	General	Visual Examination Dimensions , Layout & weight Marking Strength of Terminals Vibration	15.1&15.2 15.3 15.4 15.13 15.11
(ii)	Electrical	Charge acceptance 5Hr Capacity HRD Test at Room Temp HRD at -15°C Water Consumption Test Life cycle Reserve Capacity Cold Cranking Retention of charge Over charge endurance Electrolyte retention test Test for dry charged bty High Voltage Test Reliability of soldered area	15.8 15.5 15.6.3 15.6.1 16.3 15.10 16.1 16.2 15.17 15.12 15.18 15.15 15.16 17.7

14.0 EQUIPMENT



14.1 Voltmeter and Ammeter

The voltmeter and ammeter used shall be of an accuracy class not inferior to 0.5 in accordance with IS 1248 (Part 2) : 1983.

14.2 Thermometer

A thermometer with an appropriate scale shall be used for measuring temperature and one division of graduated scale shall represent at the most 1 deg C. The accuracy of the calibration shall be not less than 0.5 deg C.

14.3 Hydrometer

The specific gravity of the electrolyte shall be measured by a hydrometer provided with a graduated scale, one division of which shall represent at the most 0.005 unit of specific gravity. The accuracy of calibration shall be not less than 0.005 unit of specific gravity.

14.4 Instrument for Measuring Length

For measuring overall dimensions, a caliper or metal ruler shall be used of accuracy not inferior to 0.5 mm.

14.5 Weight Measuring Equipment :

For measuring of weight of battery and loss of weight in water consumption test to an accuracy of $\pm 0.05\%$

14.6 HRD tester**14.7 Constant Current Discharge Tester****14.8 Charge & Discharge Life Cycle Tester****14.9 High Voltage tester****14.10 Equipment To check Impurities percentage in Lead / Lead Alloys****14.11 Thermal Chamber (Range -20°C to $+75^{\circ}\text{C}$)****14.12 Automated Acid filling & Acid level checking facility**

Note : The list of equipments mentioned above are non exhaustive. Battery manufacturers should have all the essential manufacturing & test facilities in plant which are required for manufacturing Quality battery as per this specification.

15.0 METHODS OF TEST AND REQUIREMENTS**15.1 Visual Examination.**

The surface of the battery shall be clean. There should not be any runs of lead, bubbles, pits and cracks on the body of the battery. Conformance of the components to the relevant drawings shall be ensured during the assembly stage.

15.2 Physical Examination

For acceptance tests the batteries shall be checked for conformance to 13.1 only.

15.3 Dimensions, Layout & Weight : The dimensions and layout shall be checked for Conformance to Table VI**15.4 Marking The batteries shall be checked by visual inspection with clause 8.4**

RESTRICTED

Specification No. CQAL/637 (B):2006

& 5.2.

OR

IS Specification/approved Drawing of supplier in case Defence requirement exist

Table VI**Capacities, Overall Dimensions and Mass**

Battery Type	Capacity at 5 Hr Rate in AH C5 (0.8C20)	Capacity at 10Hr Rate in AH C10 (0.88C20)	Capacity at 20Hr Rate in AH C20	Maximum overall Dimensions (mm) of Container			Battery Height (mm) Max	Mass with Electrolyte (Kg) Max	DS Cat Number LV6/MT4 /6140-
				Length	Width	Height			
12 V 2.5 Ah		* 2.5		81	71	106	106	1.15	004649
12 V 5 Ah		* 5		121	61	131	131	2.15	005116
12 V 20 AH		*20		Drg CIL SK 667, (I) 2303 (A)				18	000094
12 V 32 AH	25.6		*32	197	129	203	227	11	000439
12V 35 Ah	28		35	197	129	203	227	11.5	---
12V 45 AH	36		*45	260	177	200	225	14.5	000490
12 V 60 AH	48		*60	260	173	204	225	18	000012
12V 60 AH	*60			306	173	204	225	24.0	005087
12 V 70 AH	56		*70	306	173	204	225	22.5	000424
12 V 92 AH	73.6		*92	410	176	213	233	31	000013
12 V 100 AH	80		*100	410	176	213	233	31	000128
12V 88AH	*88			410	176	213	233	32.5	000489
12V 120 AH	96		120	505	182	213	257	36.5	---
12V 135 Ah	108		*135	505	182	213	257	38.0	000200
# 12 V 100 Ah	80		*100	Drg CQAL-4455				25.5	Misc- CQAL- 4455

RESTRICTED



Battery Type	Capacity at 5 Hr Rate in AH	Capacity at 10Hr Rate in AH	Capacity at 20Hr Rate in AH	Maximum overall Dimensions (mm) of Container			Battery Height (mm) Max	Mass with electrolyte (Kg) Max	DS Cat Number LV6/MT4 /6140-
				Length	Width	Height			
12V 140 AH	112		*140	Drg CIL 4446				55	005188
¶ 12 V 120 AH	*120			508	222	213	257	45.0	005117
12 V 150 AH	* 120		150	Drg CIL 4421				45.0	004848
12 V 177 AH	160	*177		521	278	220	270	61.5	000139
12 V 180 AH	144		*180	521	278	220	270	61.5	005189
\$ 12 V 200 AH	160		*200	Drg CQAL-4454				64	MISC-CQAL-4454
6V 12 AH			*12	Drg CIL SK 980 C				3.5	000004
6 V 90 AH			*90	Drg CIL SK 997 A				19	000005
6V 120 AH			*120	Drg CIL SK 991 B				23	000016
6 V 150 AH			*150	Drg CIL SK 981 C				28	000007
6 V 150 AH 2A			*150	Drg CIL SK 3965				28	000163

* Indicates the 5,10 or 20 rating of the Bty. W.r.t. their DS Cat / Part No.

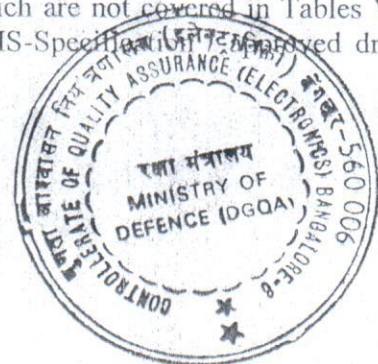
The Battery 12V/100Ah @ 20 hrs rate is used for CMT VEHICLES only.

\$ The battery 12V 200Ah 20 hr rate is used for Kolos Tatra Vehicles with Special Test.

¶ The Battery 12V/120Ah @ 5 hr rate with side terminal Protector and Top cover (Drg No.CQAL 4429A) & its applicability is for Tanks

NOTES

- 1.All acceptance tests shall be carried out on the basis of discharge at the 5-h rate only. The 20h capacity is indicated only to establish an equivalence with other test specification.
- 2.While the Supplier can have their own nomenclature, the specific designation should conform to one of the types as listed above.
- 3.Mass with electrolyte has been indicated for the purpose of reference only.
- 4.Drgs mentioned here are only for ref & for dimensional purposes only.
5. Batteries Physical / Electrical / functional parameters which are not covered in Tables VI, VIII, IX, X or XI may be checked for compliance to relevant IS-Specification (IS-1565) or drawing of supplier in case defence requirement exists.



15.5 Capacity (5-h rate)

The 5-h capacity shall be determined by discharging of fully charged battery at a constant current of $I = 0.2C_5$ amperes to a final terminal voltage of 10.50 V/5.25V for 12V/6V by under the following conditions:

- | | | |
|-----|--|--|
| (a) | Time to commence discharge | after fully charged battery has stood an Open circuit for 2 to 12h |
| (b) | Electrolyte level | between +1 mm to -5 mm from upper Level marked on battery. |
| (c) | Electrolyte temperature during discharge | 20 to 35 deg C |
| (d) | Intervals of recording current, Voltage and temperature readings | Every 30 min |
| (e) | Intervals of noting electrolyte Specific gravity | Before start and on completion of discharge. |

15.5.1 Temperature correction

The capacity obtained by multiplying the discharge current in amperes by the discharge duration in hours shall be corrected to the standard reference temperature 27 deg C as follows:-

$$C_{27} = \frac{C_t}{1 + 0.01(t-27)}$$

Where

- C_{27} = 5-h capacity at an average electrolyte temperature of 27 deg C.
 C_t = 5-h capacity at an average electrolyte temperature t, and
 t = mean of initial and final electrolyte temperature in degrees Celsius.

15.5.2 Requirement

Batteries tested shall reach the rated 5-h capacity during the course of the first three cycles after initial charge. Alternatively the battery will be deemed to have passed the capacity test if it meets 95% of the rated 5-h capacity in the first discharge.



15.6 High Rate Discharge

15.6.1 High Rate Discharge at -15°C : The high rate discharge is tested at -15°C under the following conditions:

- Before a high rate discharge test, the bty shall be subjected to a 5-h capacity test.
- The batteries under test shall comply with the conditions given in Table VII.
- The battery shall be discharged at the current specified against its type in Table IX down to a terminal voltage of 6.00 V. The terminal voltage shall be taken at 5 To 7 s and at 30 s intervals thereafter.

Table VII
Test Conditions
(clause 15.6)

Condition	Requirement
Minimum period the fully charged battery shall Stand for stabilization	16 h
Temperature of electrolyte at start of discharge	(a) $(-15 \pm 2^{\circ}\text{C})$ (b) Room Temperature $(27 \pm 2^{\circ}\text{C})$

15.6.2 Requirement

The battery shall meet the minimum terminal voltage specified after 5 to 7 s or 30 s respectively and the minimum duration to 6.00 V in Table IX.

Note : If the battery fails to reach the values specified in Table IX, two more tests may be carried out up to a total of three high rate discharges.

15.6.3 High Rate Discharge at Room Temperature: The high rate discharge is tested at room temperature under the following conditions:

- Before a high rate discharge test, the bty shall be subjected to a 5-h capacity test.
- The batteries under test shall comply with the conditions given in Table VII.
- The battery shall be discharged at the current equal to $3.5C_5$. The terminal voltage shall be as per requirement in table below.

15.6.4 Requirement

The battery shall meet the minimum discharge time specified in the table below.

Initial temperature of Electrolyte in deg C	Discharge Current (Amps)	Minimum discharge Time	Final Voltage	
			6V bty	12 V bty
$27 \pm 2^{\circ}\text{C}$	$3.5C_5$	4 Min 0 Secs	4.0 V	8.0 V
$27 \pm 2^{\circ}\text{C}$ (Special btys)	$3.5C_5$	2 Min 30 Secs	4.0 V	8.0 V



15.7 Robustness of Handles.

- (i) **Method for Hinges Type Handles:-** A load equal to twice the weight of the battery along with electrolyte is attached to one handle of the battery and the other handle is lifted with the help of a lifting device, the battery is lifted to a height of one meter with a speed of 0.2m/sec followed by smooth lowering. The process shall be repeated 5 times. After the test, no traces of loosening of the hinge from the walls of the housing, no cracking of the walls, no bending of the hinges or breaking away of the handle shall be observed.
- (ii) **Method for Moulded type fixed handles:-** Allow the battery to hang on both the handles with vertical load of 3 times of its filled weight for 2 hours (minimum) No cracks or breaking of the of the handles should be observed after completion of Test.

15.8 Charge Acceptance

The charge acceptance is tested on a new battery not subjected to any test under the following conditions, and the current value measured after an interval of 10 min from commencement of charging.

- | | |
|--|--|
| (a) State of battery before test | The battery is charged in accordance with charging procedure (Para 3.3 & 3.5). It is then discharged at the 5-h discharge rate for 2.5 h at an electrolyte temperature of 20 to 35 deg C. It is then allowed to stand at an ambient temperature of 0 ± 2 deg C for not less than 12 h. |
| (b) Temperature of electrolyte at commencement of charging | $0 \pm 2^\circ\text{C}$ |
| (c) Charging voltage at battery terminals | $14.4 \pm 0.1\text{V}$ |

Requirement :

The battery shall meet the minimum requirement in Table IX.

- 15.9. **Air Pressure test :** The seal of each cell of the battery shall be checked by compressed air as a pressure equal to 70cm of water. The volume of the tubes and auxiliary parts in connection with the cell under pressure shall not exceed 0.5 liter. Air pressure in the cell shall be noted 15 seconds after the supply has been disconnected. At the end of 15 seconds the level of water in the manometer connected to the cell shall not fall below 67 cm. The air pressure test shall be carried out in dry uncharged condition.

OR

On line Air Pressure Test can be carried out at a pressure of 250 cm water column for 3- 4 second. Drop allowed is Maximum 5 -10 cm.

15.10 Life Cycle Test

- 15.10.1 The life cycle test is carried out on a battery, which has passed the test of 15.5 and 15.6.



- (a) Throughout the test and during the checking discharges, the battery shall be kept at an ambient temperature (in a water bath or environmental test chamber) of 40 – 45 deg C.
- (b) The battery shall be subjected to a series of discharges and charges as in Table VIII
- (c) During the test, at the 25th, 50th, 75th and every 25 the cycle thereafter, a continuous discharge shall be made at the current mentioned in Table VIII. Srl No. (i) Until the terminal voltage drops down to 10.20 V and 5.1V for 6V and the duration measured.
- (d) The test is terminated when the capacity obtained as the product of discharge time (at 40 to 45 deg C ambient) and the discharge current falls to 50 percent or less of the 5-h capacity in Table VI and does not increase again.
- (e) After every checking discharge (c) the battery shall be recharged at the Appropriate current in Table VIII, Srl No. (ii) until the specific gravity (corrected to 27 deg C) and terminal voltage is constant for 3 consecutive 30 min readings.
- (f) Throughout the test, the level of electrolyte shall be maintained at the specified level by topping up with pure water/distilled water. Topping up should be down during the charging portion of cycles. The battery shall not be topped up immediately before the checking discharges (c).

Requirement: The battery shall meet the minimum requirements given in Table IX.

Table VIII
Life Cycle Test (Clause 15.10)

Srl No.	Requirement	Battery Type		
		High Current	Medium Current	Low Current
		12 V 88 AH 12 V 92 AH 12 V 100 AH 12 V 110AH 12 V 120 AH 12 V 140 AH 12 V 150 AH 12 V 177 AH 12 V 180 AH 12 V 200 AH 6 V 120 AH 6V 150 AH 6 V 150 AH 2A	12 V 45 AH 12 V 60 AH 12 V 70 AH 6V 90 AH	12 V 32 AH 12 V 20 AH 6 V 12 AH
(1)	(2)	(3)	(4)	(5)
(i)	Discharge at 1 h at current	40A	20A	10A
(ii)	Charge for 5 h at current	10A	5A	2.5A

Note: Each discharge and charge make one cycle

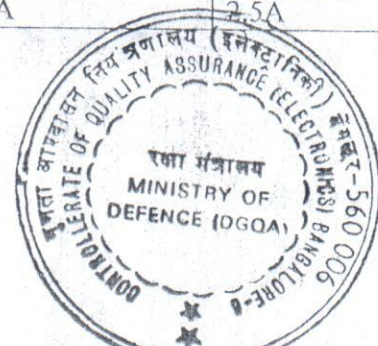


Table IX

Electrical Performances
(Clauses 15.6.1, 15.6.3, 15.8 , 15.10 and 15.12)

Battery Type	Discharge Current A	5 to 7 Sec Voltage V	30 Sec Voltage V	Duration Min	No. Of Endurance cycles	Over charge endurance units	Charge Acceptance
12 V 20 AH	60	8.4	--	2.0	165	4	3
12 V 32 AH	150	8.9	--	2.5	275	3	3
12 V 60 AH	300	7.8	--	1.9	315	7	6
12 V 70 AH	300	--	8.2	2.8	315	9	7
12 V 88 AH	500	--	8.2	2.6	485	7	11
12 V 92 AH	300	--	8.8	4.0	415	5	10
12 V 100 AH	300	--	8.8	4.0	415	5	10
12V 110 AH	500	--	8.2	2.6	485	7	11
12 V 120 AH	500	--	8.2	2.6	485	7	12
12 V 140 AH	420	9.0	--	3.5	290	4	13.5
12 V 150 AH	500	--	8.6	3.6	600	9	15
12 V 177 AH	500	--	8.9	4.8	700	11	18
12 V 180 AH	500	--	8.9	4.8	700	11	18
12 V 200 AH	500	--	9.0	5.6	785	13	20
6V 12 AH	36	4.5	--	3.5	165	4	2.5
6V 90 AH	270	4.5	--	3.5	165	4	2.5
6V 120 AH	360	4.5	--	3.5	165	4	2.5
6V 150 AH	450	4.5	--	3.5	165	4	2.5



15.11 Vibration Resistance

15.11.1 The resistance to vibration is conducted on a fully charged battery after it has passed a capacity test (15.5). The battery is tested under the following conditions:-

- (a) Discharge current during vibration = 0.2 C5 amperes.
- (b) Direction of vibration = vertical simple harmonic motion.
- (c) Peak to peak amplitude = 2.3 to 2.5 mm.
- (d) Acceleration = 3G (29.4 m/s²)
- (e) Duration of vibration = 2h.

OR

15.11.2. The test shall be performed in accordance with IS 9000(Part 8) : 1981. The samples shall be first tested for capacity test at 20-h rate before putting into vibration test. The test consists of vibrating the batteries at a frequency of 16 Hz with a total displacement of 5 mm for a period of 2 h. During vibration the batteries shall be discharged at the 20-h rate.

15.11.3 Requirement

There shall be no abnormality or sudden drop in voltage or spillage of electrolyte exhibited by the battery during the test.

15.12 Overcharge Endurance

15.12.1 The overcharge endurance test is conducted on a battery, which has passed the test of 15.5 and 15.6.1 and has been fully charged.

- (a) Throughout the test the battery shall be kept at an ambient temperature (in a water bath or environmental test chamber of 40 to 45 deg C).
- (b) The battery shall be charged at the appropriate current given in Table X for a period of 110 h.
- (c) The battery is then allowed to stand for 48 hrs on open circuit after (b).
- (d) At the end of the open circuit stand (c) the battery is discharged at the appropriate current in Table X, Srl No. (ii) for 30 seconds.
- (e) The procedure (b), (c) and (d) constitute one overcharge endurance cycle. Immediately after (d), the battery shall be subjected to the next cycle of overcharge without recharging.
- (f) When the terminal voltage of the battery reaches down to 7.20 V before 30 s in the test (d), the overcharge endurance test is terminated and the battery is deemed to have reached the end of its overcharge endurance.
- (g) During the test the battery shall be periodically topped up with pure water to maintain the correct electrolyte level.



Table X
Overcharge Endurance Test
(Clause 15.12)

Srl No.	Requirement	Battery Type		
		High Current	Medium Current	Low Current
		12 V 88 AH 12 V 92 AH 12 V 100 AH 12 V 110 AH 12 V 120 AH 12 V 140 AH 12 V 150 AH 12 V 177 AH 12 V 180 AH 12 V 200 AH 6 V 120 AH 6 V 150 AH 6 V 150 AH 2A	12 V 60 AH 12 V 70 AH 6 V 90 AH	12 V 45 AH 12 V 32 AH 12 V 20 AH 6 V 12 AH
(1)	(2)	(3)	(4)	(5)
(i)	Charging current (110 h)	9A	4.5A	2.25A
(ii)	Discharge test current to 7.20 V	250A	150A	75A

15.12.1.1 Requirement

The battery shall meet the number of overcharge endurance cycles specified in Table IX, the number excluding the last cycle in which the discharge duration was less than 30 seconds.

15.13 Strength of Terminal.

15.13.1 Fitting suitable adapters to the positive and negative terminals and applying a torque to the adapter by means of a torque wrench in the direction of rotation test the strength of terminal . The torque applied shall be as follows:-

- (a) 11.8 Nm for small terminals
- (b) 14.7 Nm for standard terminals.

15.13.2 Requirement

The battery terminals shall withstand the torque applied without breaking off or exhibiting any abnormality.



15.14 Robustness to Fastening.

15.14.1 The robustness to fastening is tested under the following conditions:

- (a) Fastening is made at ambient temperature,
- (b) During the test the temperature shall be kept between 60 to 65 deg C, and
- (c) The duration of test is 5 h after fastening. During this period and after test the state of the battery is examined.

The battery is fastened vertically, diagonally or horizontally in accordance with the method given in Table XI.

Table XI
Fastening Condition
(Clause 15.14)

Battery Type	Fastening Method	Fastening Load per One Bolt
12 V 32 AH, 12 V 60 AH 12 V 70 AH	Vertical or Horizontal	980 N
12 V 88 AH, 12 V 92 AH 12 V 100AH, 12 V 110 AH 12 V 120 AH, 12 V 140 AH 12 V 150 AH, 12 V 177 AH, 12 V 180 AH, 12V 200 AH	Diagonal or Horizontal	1960 N

15.14.2 Requirement

There shall be no visual deformation in the battery during the test.

15.15 Test for Dry-Charged Battery

15.15.1 The battery shall be tested within 60 days of manufacture.

15.15.2 The battery shall be maintained at a temperature of 27 ± 2 deg C for 24 h prior to test.

15.15.3 The battery shall then be filled with electrolyte of specific gravity 1.280 ± 0.01 , the temperature of the electrolyte before filling shall be 27 ± 2 deg C.

15.15.4 20 min after the completion of filling, the battery shall be discharged at a constant Current $I = 0.2C_5$ until the terminal voltage has fallen to 10.5 V. Readings during the discharge and the calculation of capacity shall be noted as per clause 15.5 of the specification.

15.15.5 Requirement

The battery shall give not less than 80 per cent of its rated 5 h capacity.

Note -- This test is applicable to those batteries, which have been declared as 'dry-charged' by the Supplier.

15.16 High Voltage Test

15.16.1 An AC Voltage of 8KV applied for a period of 1 minute between one terminal of the battery and the outer container of the battery.

15.16.2 There shall be no breakdown or flashover.

OR

On line high voltage test can be carried out at 8 KV applied for a period of 2 seconds between one terminal and sealing area. Criteria for acceptance is leakage current which shall not be more than 7mA.

15.17 Retention of charge test : The battery shall be fully charged at normal rate specified by the Supplier, and the level and specific gravity of the electrolyte in each cell shall then be adjusted, if necessary. The battery shall then be subjected to two consecutive capacity tests, the initial capacity C being calculated as the mean of the two results obtained. After a complete recharge and cleaning of electrolyte from its surface, the batteries are stored for a period of 28 days without disturbance at a temperature of 20 deg C to 30 deg C. The terminal voltage, specific gravity and the temperature of electrolyte in the cells will be checked once a day during this period and recorded.

15.17.1 After 28 days storage the batteries must be subjected to capacity test. The value of the capacity measured after storage is denoted by C1. The loss of capacity 'S' expressed as percentage is calculated from the following formula

$$S = \frac{C - C1}{C} \times 100 \text{ percent}$$

The loss of capacity shall not exceed 20 %

15.18 Electrolyte Retention Test : Test for electrolyte retention will be made under the following condition. The electrolyte will be adjusted to the level stated in the instruction card attached to the battery at the end of a discharge at 20h or 5h rate as relevant. The vent plugs will be firmly placed on the vent holes. The battery will then be charged at the normal rate recommended by the Supplier.

15.18.1 The escape of electrolyte shall not occur during the following tests:

When the battery is tilted through 45° in a plane normal to its major length and so held for 20 seconds

When the battery is tilted through 45° in a plane normal to its minor length and so held for 30 seconds



16.0 ADDITIONAL TESTS

The following additional tests shall be conducted wherever specified in the acceptance and control sample tests.

- (1) Reserve Capacity (16.1)
- (2) Cold cranking performance (CCA)(16.2)
- (3) Water Consumption Test (16.3)

16.1 Reserve Capacity

The reserve capacity is the period of time indicated by the Supplier in minutes for which a fully charged battery can maintain a discharge current of 25A to a cut-off voltage of 10.5 V at a temperature of 25 ± 2 deg C.

Reserve capacity test may be conducted on a battery, which has passed the tests under 15.5 and 15.6. The test conditions to be maintained are those given under the clause 15.5 (a), (d) and (e).

16.2 Cold Cranking Performance

The cold cranking performance is the discharge current in amperes, to be declared by the Supplier, which a battery can deliver at -18 deg C depending upon any one of the criteria define below:

- (i) For 60 s to a cut-off voltage of 8.4 V.
- (ii) For 30 s to a cut-off voltage of 9.0 V.

The Supplier declares cold cranking amperes conforming to any one of the above criteria. The cold cranking at -18 deg C may be conducted on a battery which has passed the requirements under 15.5 and 15.6. The battery under test shall comply with the following conditions.

- (a) The fully charged battery shall stand for stabilization for a minimum period of 20h
- (b) Temperature of electrolyte at start of discharge shall be -18 ± 1 deg C.
- (c) The battery shall be discharged at the current specified by the Supplier against its type. During discharge the terminal voltage shall be recorded after every 15 s.

16.3 Water Consumption Test. The battery after being charged shall be cleaned dried and weighed to an accuracy of $\pm 0.05\%$.

The battery shall be placed in a water-bath maintained at a temperature of 40°C to $\pm 2^\circ\text{C}$.

The top of the battery case shall emerge not more than 25 mm above the level of the water. A minimum space of 25 mm shall be maintained around each battery.

The battery shall be charged at a constant voltage of $14.4 \text{ V} \pm 0.05 \text{ V}$ (measured across the battery terminals) for a period of 500h.

Immediately after this overcharge period, the battery shall be weighed as specified.



The loss in weight shall not exceed the value 6g/Ah C_1 (or 4g/min C_1),

Alternatively, the battery shall be submitted, without water addition, to a cold cranking performance test to the end voltage $V_t=7.2V$.

16.4 SPECIAL TESTS FOR KOLOS TATRA (12 V 200 AH @ 20 hr rate)

16.4.1 HRD Test At Room Temperature The fully charged batteries will be subjected to HRD test as per sequence below at room temperature as specified below and the battery should meet the requirement.

<u>Discharge current</u>	<u>Time</u>	<u>Terminal voltage</u>
1350 A	10 Secs	8 V (min)
1000 A	10 Secs	9 V (min)
500 A	10 Secs	10 V (min)

Note : No intermediate charging is allowed between the various discharging currents as per above sequence.

16.4.2 HRD Cyclic test at Room temperature The fully charged batteries will be subjected to HRD cyclic tests as per details given below and the battery should meet the requirement as specified.

<u>Discharge Current</u>	<u>Discharge time</u>	<u>Rest time</u>	<u>No of cycles</u>	<u>Terminal voltage</u> <u>At the end of 6th</u> <u>Cycle</u>
1350 A	10 Secs	30 Secs	6	6V (min)

Note : No intermediate charging is allowed between the cycles.

16.4.3 HRD at $-10 \pm 3^\circ C$ The fully charged batteries will be subjected to HRD tests as at $-10 \pm 3^\circ C$ per details given below and the battery should meet the requirement as specified. The batteries shall be conditioned at $-10 \pm 3^\circ C$ for 16 hrs before the HRD test.

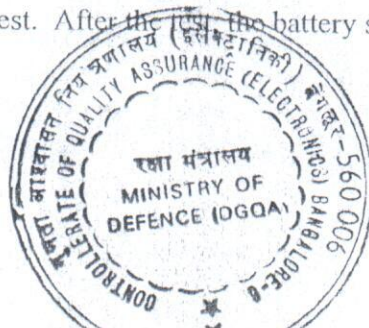
<u>Discharge current</u>	<u>Voltage at</u> <u>5 – 7 Secs</u>	<u>Voltage at</u> <u>3 min 30 secs</u>
600 A	9V (min)	6 V (min)

17.0 ENVIRONMENTAL TESTS (FOR SPECIAL BATTERY i.e. 12 V 20 AH)

17.1 Contamination Test.

17.1.1 The battery shall be charged as per laid down procedure.

17.1.2 The battery shall then be subjected to contamination test. After the test the battery shall



RESTRICTED

Specification No. CQAL/637 (B):2006

be examined for any physical damage. The battery shall be allowed to remain under normal atmospheric conditions for a period of 2 hours and then discharged and Ah value shall be recorded. The Ah value shall comply with the requirements.

17.2 Dust Test.

The battery shall be charged as per laid down procedure. The vent plugs shall be in closed condition. The battery shall then be subjected to dust test as per test No. 14 of JSS 55555:2000. After completion of test, the battery shall be wiped off to remove external dust and shall be allowed to remain under normal atmospheric conditions for one hour and then shall be subjected to discharge test. The battery shall comply with the specified requirements.

17.3 Dry Heat Test.

The battery shall be charged as per laid down procedure. The battery shall then be kept in a dry heat chamber the inside temp of which is maintained at $70^{\circ}\text{C} + 2^{\circ}\text{C}$ for 6 hours. While still in the chamber at 70°C , the battery shall be discharged. The battery shall comply with the specified requirements. The battery shall be taken out of Dry Heat Chamber and be physically examined. There shall be no signs of any physical damage to the battery.

17.4 Impact Strength.

This test is conducted on the battery, which has passed the tests at Para 13.1. The battery is charged as per the specified procedure. The checking of impact strength is carried out with an acceleration of 117.7m/sec^2 (12 g) for impulse duration of 10 to 15 msec with frequency of impact unto 100 per minute for a total number of 2000 impacts. At the end of the test the surface of the battery is examined. There shall be no damage to the parts. Presence of isolated drops of electrolyte on the surface of the battery is permitted. The battery shall be allowed to remain for a period of 1 hour under the normal atmospheric conditions. The battery shall then be subjected to starting discharge operation test. The battery shall conform to the requirement mentioned at para 15.5

17.5 Damp Heat Test.

17.5.1 Damp Heat Test shall be carried out on the battery in dry state. Damp heat test shall be conducted in accordance with test number 10 of JSS 55555: 2000 as follows:
Exposure for 16 hours at $+40 \pm 2^{\circ}\text{C}$ and Relative humidity not less than 95%.
Exposure for 3 hours at Lab temp. Saturation of the chamber atmosphere with water vapour shall occur during this period.

The battery shall be taken out from the damp heat chamber and shall be allowed to remain under standard recovery conditions for a period of 2 to 4 hours. The battery shall then be visually examined. There shall be no damage or corrosion to the exposed parts of the battery.

RESTRICTED



17.6 Corrosion (Salt) Test.

This test shall be conducted on the battery in dry state. The test shall be conducted in accordance with procedure No. 3 of Test No. 9 of JSS 55555: 2000; the duration of salt spray shall be for 1 hour. The battery shall then be taken out of salt spray chamber and wiped clean taking care not to cause short circuit of the terminals. The battery shall then be stored at standard ambient temperature for 2 to 4 hours. At the end of recovery period, the battery shall be visually examined. There shall be no damage or corrosion to the exposed parts of the battery.

17.7 Reliability of soldered areas.

17.7.1 This test is conducted on the battery, which has passed the capacity test. The battery, shall be charged as per specified procedure. An alternate cycle of discharge and break as given below shall be carried out till the terminal voltage of the battery reaches 12V.

17.7.2 Discharge of 1280A for duration of 5 sec followed by break for duration of 10 sec.

17.7.3 There shall be no change in the shape and appearance of the soldered areas and current carrying parts w.r.t. before the discharge was conducted. The reliability of internal soldered areas and the absence of internal damages to the parts are assessed by conducting discharge test. The battery shall conform to the specified requirements mentioned at Para 15.5.

17.8 Dry Storage Test (6 months)

The dry charge test as above shall be repeated on the batteries stored for a period of 6 months (without recharging). The battery shall be kept at a temp of $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for not less than 24 hours. The battery shall then be filled with electrolyte having a temp of $27^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and specific gravity of 1.280 ± 0.010 (at a temp of 27°C). The electrolyte level shall be 10 to 12 mm above the above the protective shield. The battery shall be kept in the filled condition for 20 minutes. After 20 minutes, the battery is discharged at 420 A to an end voltage of 6.0 V. During discharge, the terminal voltage shall be taken at 5 to 7 seconds from the start and at intervals of 30 sec thereafter. The duration to reach the end voltage shall not be less than 3 minutes.

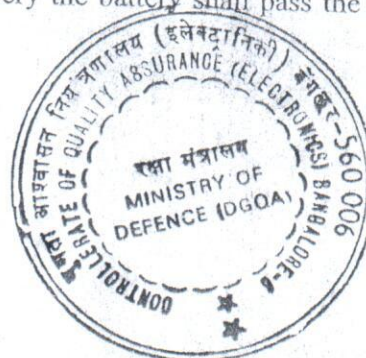
17.9 Drop Test.

17.9.1 Drop test shall be carried out as per Test Number 13, Clause 3.2.3, test condition 'C' of JSS 55555. The batteries shall be dropped on its base from a height of 100 mm and the number of drops shall be six.

17.9.2 The battery shall be examined for any physical damage and there shall be no leakage/spillage of electrolyte.

17.10 Tropical exposure Test

17.10.1 The battery shall be exposed to tropical conditions as laid down in clause 9.0 of JSS 55555. The duration of the test shall be 14 days. After recovery the battery shall pass the air pressure test as per clause 15.9 of this specification.

18.0 TRANSIT AND STORAGE.

- 18.1 The battery shall always be in a state of full charge before being packed for shipment.
- 18.2 The battery shall be placed with adequate packing on all sides and transported in upright position only.
- 18.3 The Supplier shall be responsible for the safe delivery of stores at the consignee's end and transit damage if any shall be promptly attended to by him.
- 18.4 The battery shall be protected against rain, mist, dust, snow and direct sun while in transit and storage as far as possible. It shall be stored in a cold dry atmosphere away from source of heat and fumes.
- 18.5 While in storage the voltage of the battery shall be checked once in 6 months. If the voltage falls below the specified voltage, the battery shall be charged. Necessary charging instructions shall be provided by the Supplier along with the battery.

19.0 Receipt Inspection by the Consignee.

- 19.1 The receipt inspection shall be carried out through visual examination to ensure the correctness and completeness of the items received against each inspection.

Note. Discrepancies and transit damage if any will be taken up with the under intimation to all concerned.

20.0 Stocking and Issue.

- 20.1 The stores shall be stocked for the barest minimum period (6 months) in the depots. The battery shall always be stored in fully charged condition. The voltage of the battery should be checked periodically. If the battery voltage falls below 10.75 volts for a 12 V battery and below 4 V for a 6 V battery after 6 months, the battery shall be revived to its full capacity and voltage by providing a maintenance charge.

- 20.2 The battery shall be issued too the units as soon as possible on first-in first-out basis and it shall be ensured that full benefits accruing from the warranty clause are made available to the user.

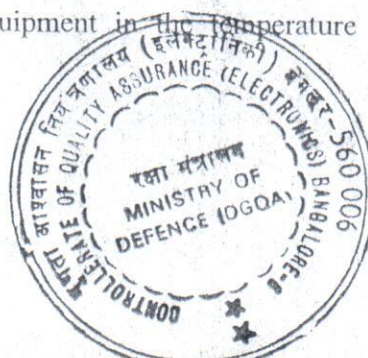
- 20.3 Batteries shall be issued to the user along with all associated items as originally supplied by the Contractor.

- 20.4 Under no circumstances the batteries shall be stocked beyond the warranted shelf life Period of 6 months.

21.0 Warranty

The Supplier will render the following warranty in respect of batteries:-

- That the batteries supplied will be free from manufacturing defects and this will be repaired / replaced in-situ, free of cost, if found defective within a period of 24 months from date of acceptance.
- Minimum one year shelf life when stored at any temperature in the range from -30°C to $+70^{\circ}\text{C}$.
- Satisfactory functioning with the main equipment in the temperature range from -30°C to $+55^{\circ}\text{C}$.



21.2 Control Sample

21.2.1 To ensure that batteries give specified/guaranteed number of life cycle, control samples are to be drawn on the following scale:-

<u>Total Qty on order</u>	<u>No. of Control Samples to be drawn</u>
(i) For upto and including 1000 Nos.	02 samples
(ii) For upto and including 2000 Nos.	02 samples for every 1000 Nos
(iii) Exceeding 2000 Nos.	04 samples for the first 2000 Nos. and 1 sample for every 1000 Nos of the balance Qty on order.

21.2.3 The contractor shall indicate in advance the schedule of production for the entire quantity on order and will ensure that the same is continuous and consistent.

21.2.4 For orders for qtys upto 500 nos, the entire qty on order will be produced in one batch and tendered in one lot.

21.2.5 For orders for qtys upto 2000 nos, production will be done in batches of 1000 nos.

21.2.6 For orders for qtys running into several thousands, the production will be done in minimum of 1000 nos. (or multiple of 1000 nos.) and lot tendered will consist minimum of 1000 nos. each time.

21.2.7 The month and year of manufacturing to be marked on the individual batteries will be that conforming to the month and year of tendering the lot. Warranty period will be counted from the date of acceptance of stores.

21.2.8 The control samples drawn from the lot will be treated as a true representative of the particular lot and the results of the life cycle test on these samples will be applicable to the entire quantity comprising the lot.

21.2.9 The selection of control samples mentioned at clause 21.2 above will be at the discretion of the AHSP and it is dependent on the performance of the quality of the supplies observed by the AHSP.

Sd/- xxx
(B. Veerabhadrappa)
Assisant Controller

Dated: May, 2011

for Director General Quality Assurance

RESTRICTED



BY SPEED POST *A*

6/8/13
आर : एष्यूरलेक
बंगलौर

Telegram : 'ASSURELEC'
BANGALORE

फोन
Telephone 3331112

फैक्स सं०
Fax No. : (080) 3338155

संदर्भ संख्या

Ref No. 028982 / TD DIV

TO: THE GENERAL MANAGER,
Government of INDIA, Ministry of Defence,
Indian Ordnance Factories,
Vehicle Factory.
JABALPUR:-482009 M.P.

SUPPLY OF SPECIFICATION.

Ref: your letter No: 100/MISC/R&D, dated; 10-07-13.
With reference to your letter at above, dated: 10-07-13.
The specification No: (QAL: 637(B) is here with
Forwarded to you please.

Encls.: 01 copy SPECN
As mentioned above.

Arnold
(EPARNOLD)
JTO (D)
For Controller.

JWM/CBS/sh k h Singh

pl issue Copy to TSS, R&D.
For m.c.

Cu
8/8/13

भारत सरकार
GOVERNMENT OF INDIA

रक्षा मंत्रालय (गुणता आश्वासन महानिदेशालय)
MINISTRY OF DEFENCE (DGQA)

गुणता आश्वासन नियंत्रणालय (इलेक्ट्रॉनिक्स)
CONTROLLERATE OF QUALITY ASSURANCE
(ELECTRONICS)

पोस्ट बक्स सं० 606, बंगलौर-560 006
POST BOX No. 606, BANGALORE-560 006

दिनांक 02 Aug 2013
DATE 02 Aug 2013