

SPECIFICATION

FOR

BATTERY, SECONDARY - PORTABLE, LEAD-ACID TYPE

12V, 50 Ah (FULLY DRY CHARGED) No [REDACTED] K 1 (UK/2HN)

NATO STOCK No 6140-99-111-5238

1. GENERAL

This Supplement is to be read in conjunction with the general specification for batteries, secondary, portable, lead-acid type contained in DEF STAN 61-9 (PART 1).

2. CONSTRUCTION

The construction is to be in accordance with the requirements of Drawing FV 546178, Sheets 1 and 2 (latest issue) and all associated drawings, obtainable from the Procurement Executive, Ministry of Defence, Military Vehicles and Engineering Establishment, Chobham Lane, Chertsey, Surrey KT16 0EE.

3. CONTAINER AND LID MATERIALS (general specification, Annex A)

a. Impact strength (Annex A, clause 3).

The value obtained from any sample is to be not less than 0.136 J.

b. Plastic yield (Annex A, clause 4).

The value obtained from any sample is to be not greater than 5.0 mm.

c. Resistance to attack by acid (Annex A, clause 6).

The change of mass and volume of samples tested is to be not greater than 1%.

4. MASS

The mass of the battery when filled with electrolyte to the level of the perforated separator guard in the fully charged state, shall not exceed 18 kg.

5. QUALIFICATION APPROVAL TESTING

Ten batteries are to be provided, four each for sub-groups I and IV and one each for sub-groups II and III of the group C tests specified in clause 6 of this Supplement.

6. APPLICABLE TESTS

a. Qualification Approval and production inspection group A tests.

Tests to be applied to each battery:

TEST	SPECIFICATION CLAUSE	
	GENERAL	SUPPLEMENT
Polarity of plates	20a	-
Plate separation	20b	-
Sealing	20c	7
Dryness	20d	8

b. Production inspection group B tests.

Random samples shall be taken from each production batch at a rate in accordance with clause 15b of the general specification, and subjected to the following tests:

TESTS IN ORDER OF APPLICATION	SPECIFICATION CLAUSE	
	GENERAL	SUPPLEMENT
Immediate discharge high rate	21h(3)	9
Mass	21e	4
Capacity discharge 20-hour rate	21j(1)	10
Capacity discharge high rate at -40°C	21j(9)	12

6. c. Qualification Approval and production in spection group C tests.

At intervals of 2000 batteries produced, 10 batteries are to be subjected to the full range of Qualification Approval tests (see clause 5).

TESTS IN ORDER OF APPLICATION	SPECIFICATION CLAUSE		SUB-GROUP			
	GENERAL	SUPPLEMENT				
Two years storage	21q	-	-	-	-	IV
Sealing	20c	7	-	-	-	IV
Immediate discharge high rate	21h(3)	9	I	II	III	IV
Mass	21e	4	I	II	III	IV
Capacity discharge 20-hour rate	21j(1)	10	I	II	III	IV
Electrolyte retention	21f	11	I	II	III	IV
Capacity discharge high-rate at -40°C	21j(9)	12	I	II	III	IV
Capacity discharge high-rate at 25°C	21j(6)	13	I	II	III	IV
Charge retention test B	21k(2)	14	I	II	III	IV
Thermal shock test	-	15	-	II	-	-
Short circuit test	-	16	-	-	III	-
Vibration test	-	17	-	-	III	-
Life test B	21n	18	I	-	-	IV

Note: Tests on sub-groups I, II, and III are to commence within 60 days from date of manufacture of the sample batteries.

7. TESTS FOR EFFICIENCY OF SEALING (general specification, clause 20c)

The test shall be applied after final assembly.

8. TEST FOR DRYNESS (general specification, clause 20d)

This test shall be applied before the battery lid is fitted.

9. IMMEDIATE DISCHARGE TEST - HIGH RATE (general specification, clause 21h(3))

The discharge current shall be 150 amperes.

10. CAPACITY DISCHARGE TEST - 20-HOUR RATE AT 25°C (general specification, 21j(1))

For the purpose of this test the 20-hour rating shall be taken as 50 amperes-hours.

11. ELECTROLYTE RETENTION (general specification, clause 21f)

Test A is to be applied with the battery on open circuit.

12. CAPACITY DISCHARGE TEST - HIGH RATE AT -40°C (general specification, clause 21j(9))
 - a. The discharge current shall be 150 amperes.
 - b. The voltage at five seconds shall be not less than 8.0 volts.
 - c. Duration of discharge to the on-load-voltage end-point of 6.0 volts shall be not less than 75 seconds.
13. CAPACITY DISCHARGE TEST - HIGH RATE AT 25°C (general specification, clause 21j(6))
 - a. The discharge current shall be 150 amperes.
 - b. The voltage at five seconds shall not be less than 10 volts.
 - c. Duration of discharge to the on-load voltage end-point of 8.0 volts shall be not less than five minutes and 50 seconds.
14. CHARGE RETENTION TESTS - TEST B (general specification, clause 21k(2))
 - a. The discharge current shall be 150 amperes.
 - b. Duration of discharge to the on-load voltage end-point of 6.0 volts shall be not less than 45 seconds.
15. THERMAL SHOCK TEST
 - a. The battery shall be charged in accordance with clause 21c of the general specification.
 - b. With the battery at room temperature it shall be tested for efficiency of sealing in accordance with clause 20c of the general specification.
 - c. The battery shall then be placed in a cold chamber at an ambient temperature of $40 \pm 2^\circ\text{C}$ for 24 hours.
 - d. The battery shall then be removed from the cold chamber and without delay placed in a hot chamber with an ambient temperature of $65 \pm 2^\circ\text{C}$ for 24 hours.
 - e. The battery shall then be removed from the hot chamber, allowed to cool to a temperature of $25 \pm 2^\circ\text{C}$ and tested for efficiency of sealing as in sub-clause 15b.
 - f. Electrolyte levels shall be adjusted if necessary by the addition of distilled water and the battery brought to the fully charged condition as in sub-clause 15a.
 - g. Test procedures stated in sub-clauses 15c to 15f shall be repeated.
 - h. The battery shall then be subjected to the 20-hour rate capacity discharge test specified in clause 10 of this Supplement except that only two cycles of discharge/charge are to be applied instead of three. The duration of the second discharge is to be not less than 20 hours. If 20 hours is attained in the first discharge, the second discharge need not be carried out.
 - j. During and on completion of the above tests, the efficiency of sealing shall be unimpaired and the battery shall show no evidence of other damage.

16. SHORT CIRCUIT TEST

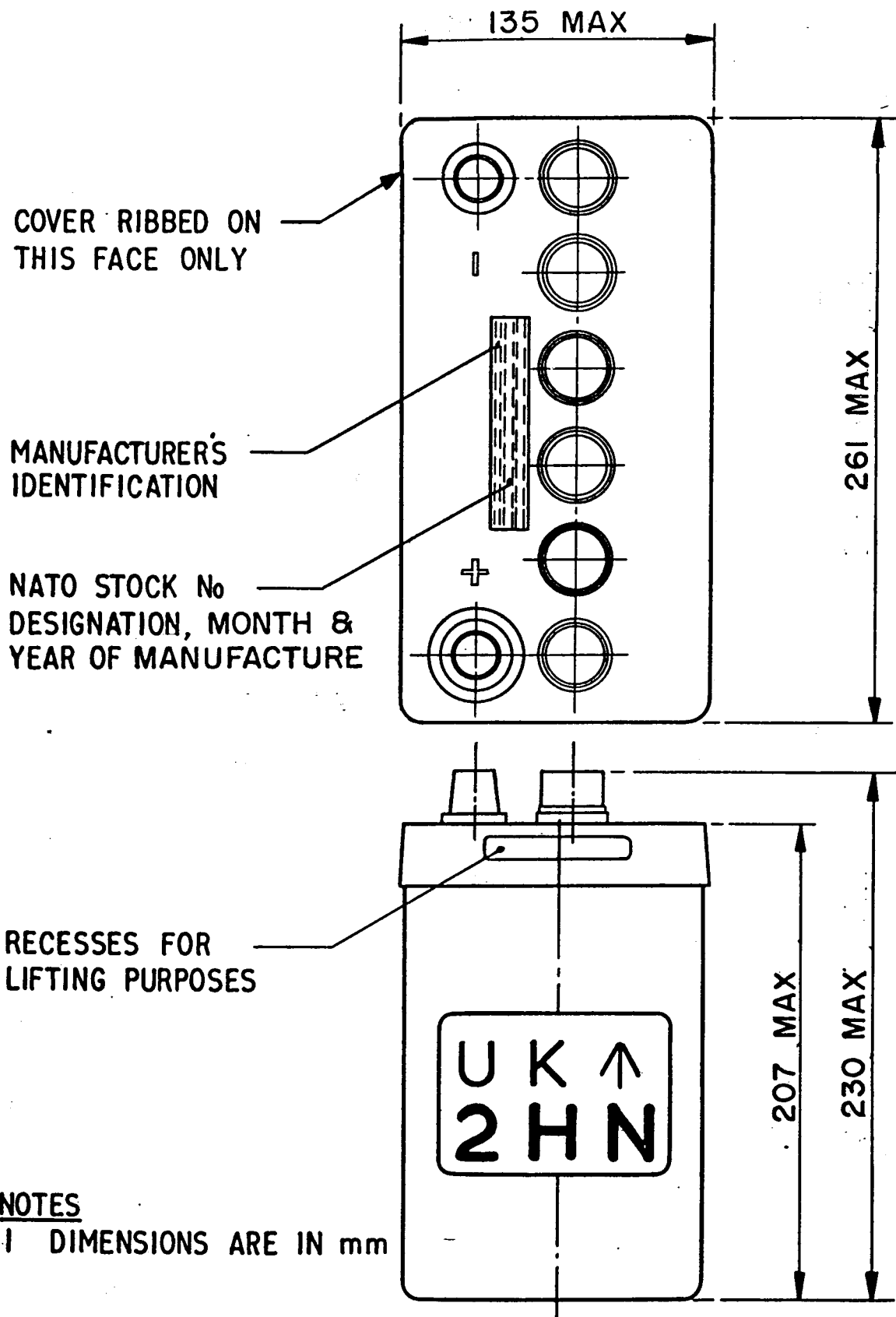
- a. The battery shall be fully charged in accordance with the general specification, clause 21c.
- b. The battery shall then be left to stand until the temperature of the electrolyte has fallen to $25 \pm 2^{\circ}\text{C}$ and any gassing has ceased.
- c. The test circuit shall employ the specified mating connectors and maximum size of copper conductor to fit this connector.
- d. A switch shall be connected with the minimum length of cable to provide the test circuit. The resistance of the test circuit including connectors, cable, and switch contact resistance shall not exceed 2 milliohms (0.002 ohms), and shall not be less than 1.5 milliohms (0.0015 ohms).
- e. The test circuit shall be connected to the battery for a period of 60 seconds.
- f. No damaging effect on the battery or its performance shall result from the short circuit test.

17. VIBRATION TEST

- a. Batteries subjected to vibration tests are first to have satisfied the requirements of the preceding performance tests.
- b. On completion of the tests in accordance with clause 17a the battery is to be re-charged in accordance with clause 21c of the general specification.
- c. The battery is to be placed in an ambient temperature of $55 \pm 5^{\circ}\text{C}$ for a period of 24 hours.
- d. On completion of conditioning in accordance with clause 17c, the battery is to be stabilised at $25 \pm 5^{\circ}\text{C}$.
- e. The battery is to be firmly secured in an upright attitude, to a vibration test machine by means of a holding frame or bar, bearing on its upper surface and not on the filler plugs or terminals. The battery is then to be vibrated for a period of two hours consisting of 40 minutes in each of the three mutually perpendicular directions in line with the three axes of the battery. Vibration is to be at a frequency of 33 to 35 hertz and at an amplitude of 1.14 to 1.27 millimetres (total excursion 2.29 to 2.54 millimetres). Throughout this test the battery shall be under discharge at 2.5 amperes.
- f. The battery is to be removed from the vibration test machine and cooled until the electrolyte temperature is stabilized at $40 \pm 2^{\circ}\text{C}$. The battery is then to be immediately replaced on the vibration test machine and tested in accordance with clause 17e (except that periods are for 20 minutes in each of the three mutually perpendicular directions) for a further period of 1 hour. Throughout this period the battery shall be under discharge at 2.5 amperes.
- g. Voltage and discharge current of the battery shall be monitored throughout the vibration test. There shall be no evidence of instability. On completion of the vibration tests the battery is to show no evidence of external damage or spilt electrolyte.

17. h. After the battery temperature has been stabilized at $25 \pm 2^\circ\text{C}$, the battery is to be recharged in accordance with clause 21c of the general specification. The battery shall then be discharged at the 20-hour rate (general specification 21j(1)). Duration of discharge to 10.5 volts shall be not less than 20 hours.
- j. The battery is then to be dismantled and examined. There is to be no evidence of excessive sediment, broken connections, straps, plates broken or defective separators, or other damage.
18. LIFE TEST B (general specification, clause 21n).
- a. 20-hour rate capacity - 50 ampere-hours.
 - b. High rate discharge current - 150 amperes.
 - c. Minimum number of 14-day life test sequences - 4.

NATO STOCK No 6140-99-III-5238



NOTES

1 DIMENSIONS ARE IN mm

2 FOR FURTHER DETAILS SEE DRAWING No FV 546178 SHEETS 1 & 2

THIRD ANGLE PROJECTION



Procurement Executive, Ministry of Defence

Directorate of Standardization

Room 1138, Kentigern House, 65 Brown Street, GLASGOW, G2 8EX

Telephone: 0141-224 2595 (Direct Dialling)

Fax: 0141-224 2503

0141-248 7890 (Switchboard)

Internet e-mail address: t.leaver@dstan.mod.uk

Your Reference :

Our Reference : D/DStan/11/2

Date : 9 November 1998

Removal of Product Qualification Approval

IMPORTANT ANNOUNCEMENT

1. This Standard contains a Product Qualification Approval (PQA) scheme. ⁱMOD policy requires that all PQA schemes are removed from Defence Standards called up in contracts placed after 1st January 1998.
2. Users of this Standard are to contact the Project Manager (PM), Equipment Support Manager (ESM) or Technical Service Authority (TSA) named in the contract or order, to identify whether there is a continuing need for an approvals scheme.
3. ⁱⁱProduct Conformity Certification (PCC) is a risk based process that replaces PQA. Once a risk has been identified PCC can be included as a contract clause. In exceptional circumstances agreement can be sought from AD/Stan for PCC to be included in a Defence Standard.
4. At the next revision of this Standard the PQA scheme will be removed.

T R Leaver
Head of Standards Programme Management
Tel: 0141 224 2595 FAX: 0141 224 2503

ⁱ Defence Council Instruction (General) 197/97; Quality Temporary Memorandum 5/98; Chief of Defence Procurement Instruction CDPI/TECH/250 (draft)

ⁱⁱ PCC is certification that a product meets its specification. When PC is required by the contract, the contractor is responsible for obtaining the necessary PCC. Certification shall be provided from a NAMAS accredited laboratory when appropriate. PCC shall apply where a Risk Assessment has been identified by the PM; ESM or TSA.