



Concorde Battery Corporation

2009 San Bernardino Road
West Covina, California, USA 91790

RG-235

24 VOLT 44 Ah, VALVE REGULATED, LEAD-ACID, AIRCRAFT BATTERY

DECLARATION OF DESIGN PERFORMANCE

TO THE REQUIREMENTS OF

RTCA DO-293A and IEC 60952-1

Applications: Engine Starting and Emergency Power

NOTE: Applications may not be a complete list of all applications for this battery type.

The data/information contained herein has been reviewed and approved for general release on the basis that this document contains no export-controlled information

Characteristic	RTCA DO-293A IEC 60952-1	Requirement/Performance	Test Report / Reference
Description	<p>The RG-235 is a 24 volt battery designed for engine starting and emergency power.</p> <p>The RG-235 contains two MB12-44A monoblocks. Each MB12-44A monoblock consists of six 2 volt cell groups connected in series creating a 12 volt monoblock. The cells are housed within a polypropylene container and cover which are attached together using epoxy. The two 12 volt monoblocks are connected in series making the 24 volt assembly which is then housed within a container and cover made of aluminum. The outer housing provides the battery assembly with increased protection from fire with the aluminum housing being fire resistant. All batteries use a quick disconnect connector which dimensionally conforms to MS3509. The battery hold down is incorporated into the outer housing container.</p> <p>The electrolyte is a sulfuric acid and water solution and is absorbed within the battery plates and separators. There is no free electrolyte. See Material Safety Data Sheet for hazardous material identification and precautions.</p>		
Format	IEC 60952-2	Concorde Drawing No. RG-235	
Connector	IEC 60952-2	The battery is equipped with a Type Q terminal conforming to MS3509.	
Mass		RG-235 - 39.0 kg Max (86.0 lbs).	
Charging method	IEC 60952-1, 4.3	Constant potential at 28.25 V	
Any auxiliary requirement:		None	
Ventilation	DO-293A, 1.9 IEC 60952-2	Battery is equipped with vent tubes	
Flammability	IEC 60952-2	Outer container is fire resistant.	
Spillability		Non spill	
Electrical Performance			
Rated Capacity (C1)	DO-293A, 2.2.2 IEC 60952-1, 5.1.1	44 Ah	
Capacity at -18°C	DO-293A, 2.2.3 IEC 60952-1, 5.1.2	15.5 Ah when discharged at the C ₁ rate.	
Capacity at -30°C	DO-293A, 2.2.4 IEC 60952-1, 5.1.3	10.5 Ah when discharged at the C ₁ rate.	
Capacity at +50°C	DO-293A, 2.2.5 IEC 60952-1, 5.1.4	44 Ah when discharged at the C ₁ rate.	
Power Rating +23°C	DO-293A, 2.2.6.1 IEC 60952-1, 5.2.1.1	I _{pp} = 1150 A, I _{pr} = 925 A	
Power Rating -18°C	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.2	I _{pp} = 900 A, I _{pr} = 700 A	
Power Rating -30°C	DO-293A, 2.2.6.3 IEC 60952-1, 5.2.1.3	I _{pp} = 650 A, I _{pr} = 550 A	
Rapid Discharge Capacity at 23°C	DO-293A, 2.3.1 IEC 60952-1, 5.3.1	15 Ah when discharged at 10 times the C ₁ rate to 10 volts.	

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Rapid Discharge Capacity at -30°C	DO-293A, 2.3.2 IEC 60952-1, 5.3.2	4 Ah when discharged at 10 times the C ₁ rate to 10 volts.	
Charge Retention	DO-293A, 2.4 IEC 60952-1, 5.4	+23°C - Rating value for design = 90 %	
		+50°C - Rating value for design = 80 %	
Storage	DO-293A, 2.5 IEC 60952-1, 5.5	DO-293A - 1 year storage life test is in process.	
Charge Stability	DO-293A, 2.6 IEC 60952-1, 5.6, Class I	OK. Max battery temperature on charge = 54 °C. Charge current fell during the entire charge period. Capacity at end of test > C ₁	
Short-circuit Current	DO-293A, 2.7 IEC 60952-1, 5.7	Peak current = 2100.9 A Last recorded current = 471 A at 2.4 s	
Charge Acceptance	DO-293A, 2.8 IEC 60952-1, 5.8	+23°C = 97% See Appendix A for plot of charge data	
		-18°C (battery with heaters only) N/A	
		-40°C (battery with heaters only) N/A	
Insulation Resistance	DO-293A, 2.9.1 IEC 60952-1, 5.9.1	The RG-235 successfully met the test requirements.	
Dielectric Strength	DO-293A, 2.9.2 IEC 60952-1, 5.9.2	The RG-235 successfully met the test requirements.	
Duty Cycle Performance	DO-293A, 2.10 IEC 60952-1, 5.10	OK. 100 cycles of engine start sequence. Capacity > C ₁ after 4 hour CP charge.	
Water Consumption Test	DO-293A, 2.11 IEC 60952-1, 5.11	N/A	
Overcharge Endurance	DO-293A, no requirement IEC 60952-1, 5.12	Not tested	
Cyclic Endurance	DO-293A, 2.12 IEC 60952-1, 5.13	100 cycles successfully completed.	
Deep Discharge	DO-293A, 2.13 IEC 60952-1, 5.14	After sitting in a discharged condition for 4 weeks: Battery recovered 105 % of its initial capacity.	
Induced Destructive Overcharge	DO-293A, 2.14 IEC 60952-1, 5.15	All test requirements were successfully met.	
Electrical Emissions	DO-293A, 2.15 IEC 60952-1, 5.16	N/A, Battery contains no active electronics.	
Environmental Performance			
Vibration	DO-293A, 3.1 IEC 60952-1, 6.1	Qualified per DO-293A to DO-160G, random vibration test per Curve C, section 8, 1 hour per axis.	
Acceleration	DO-293A, no requirement IEC 60952-1, 6.2	Not tested	
Operational Shock	DO-293A, 3.3.1 IEC 60952-1, 6.3, Class I	Qualified per DO-293A to DO-160G, Category B. Each shock pulse had an amplitude of 6g's for 11ms.	

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Crash Safety Shock	DO-293A, 3.3.2 IEC 60952-1, 6.4	Qualified per DO-293A to DO-160G, Category B, impulse and sustain. Impulse shock pulses were of the saw tooth configuration. The battery was tested per DO-160G Table 7-1, Aircraft type 5, Test type R, 20g's in each orientation.	
Explosion Containment	DO-293A, 3.4 IEC 60952-1, 6.5	Qualified per DO-293A to DO-160G. All test requirements were met.	
Altitude	DO-293A, 3.5 IEC 60952-1, 6.6	Qualified to 20621m (67654 ft) per DO-293A.	
Rapid Decompression	DO-293A, 3.5.2 IEC 60952 no reqmt	Qualified from 2300m (8000 ft) to 20621m (67654 ft) per DO-293A.	
Temperature Shock	DO-293A, 3.6 IEC 60952-1, 6.7	Qualified per DO-293A. Temperature cycles from +85°C to -55°C.	
Fungus Resistance	DO-293A, 3.7 IEC 60952-1, 6.8	Component test. All components have been tested and qualified per DO-160G, Category F.	
Humidity	DO-293A, 3.8 IEC 60952-1, 6.9	Qualified per DO-293A to DO-160G, Category B.	

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Fluid Contamination	DO-293A, 3.9 IEC 60952-1, 6.10	Component test. Test was performed on representative material samples. All samples successfully met the test requirements. Fluids tested: Fuels. Aviation Jet A fuel Aviation piston engine fuel (100LL AVGAS) Hydraulic fluids Mineral based (MIL-H-5606) Non-mineral based synthetic (MIL-PRF-83282 and MIL-PRF-87257) Lubricating oils Mineral based (MIL-L-6081) Ester based synthetic (MIL-L-23699) Internal combustion engine SAE 15W40 Solvents and cleaning fluids Isopropyl alcohol (TT-I-735) Denatured alcohol De-icing fluid Ethylene Glycol Propylene Glycol AMS 1424 (SAE AEA Type I) AMS 1428 (SAE AEA Type VI) Insecticides - none Sullage - none Disinfectants (heavy duty phenolics) - none Coolant dielectric fluid - none Fire extinguishants - none	
Salt Spray	DO-293A, 3.10 IEC 60952-1, 6.11	Qualified per DO-293A to DO-160G, Category S.	
Physical Integrity at High Temperature	DO-293A, 3.11 IEC 60952-1, 6.12	Qualified per DO-293A.	
Flammability	DO-293A, no requirement IEC 60952-1, 6.13	Not tested. See Section 1	
Electrolyte Resistance	DO-293A, 3.12 IEC 60952-1, 6.14	Component test. All components met the specification requirements.	
Thermal Sensors	DO-293A, 3.13 IEC 60952-1, 6.15	N/A	
Component Qualification tests	DO-293A, 3.14 IEC 60952-1, 6.16	Component test. All components successfully met the performance requirements of the test.	
Battery Airtightness	DO-293A, no requirement IEC 60952-1, 6.17	N/A	

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Cell Baffle	DO-293A, no requirement IEC 60952-1, 6.18	N/A, Applies only to nickel-cadmium batteries only.	
Strength of Receptacle	DO-293A, 3.15 IEC 60952-1, 6.19	OK	
Handle Strength	DO-293A, 3.16 IEC 60952-1, 6.20	OK	

N/A = Not Applicable

Authentication:

Manufacturer. Concorde Battery Corporation

Signed:
Name of signatory: John B. Timmons, PE
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