



Concorde Battery Corporation

2009 San Bernardino Road
West Covina, California, USA 91790

RG-220

24 VOLT 21 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 24-volt RG-220 battery is designed for engine starting and emergency power.</p> <p>The battery consists of twelve 2-volt cells connected in series. The battery is constructed of a one piece plastic container and cover which are secured together with an epoxy cement. The container and cover are made of high-impact polypropylene. The handle assembly is incorporated into the cover. The RG-220 is fitted with internal M8 female thread connectors.</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-220	
Connector	IEC 60952-2	The battery is available with M8 female threaded connectors	
Mass		44.1 lbs (20.0kg)	
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	None	
Flammability	IEC 60952-2	Flammable	
Spillability		Non spill	
Electrical Performance			
Rated Capacity (C1)	DO-293A, 2.2.2 IEC 60952-1, 5.1.1	21 Ah	
Capacity at -18EC	DO-293A, 2.2.3 IEC 60952-1, 5.1.2	16 Ah when discharged at the C ₁ rate.	
Capacity at -30EC	DO-293A, 2.2.4 IEC 60952-1, 5.1.3	11 Ah when discharged at the C ₁ rate.	
Capacity at +50EC	DO-293A, 2.2.5 IEC 60952-1, 5.1.4	21 Ah when discharged at the C ₁ rate.	
Power Rating +23EC	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.1	I _{pp} = 1100 A, I _{pr} = 800 A	
Power Rating -18EC	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.2	I _{pp} = 800 A, I _{pr} = 600 A	
Power Rating -30EC	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.3	I _{pp} = 625 A, I _{pr} = 425 A	
Rapid Discharge Capacity at 23EC	DO-293A, 2.3.1 IEC 60952-1, 5.3.1	12 Ah when discharged at 10 times the C ₁ rate to 10 volts.	
Rapid Discharge Capacity at -30EC	DO-293A, 2.3.2 IEC 60952-1, 5.3.2	5 Ah when discharged at 10 times the C ₁ rate to 10 volts.	

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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 still in process.	
Charge Stability	DO-293A, 2.6 IEC 60952-1, 5.6, Class I	OK. Max battery temperature on charge = 59.4EC. Charge current fell during the entire charge period. Capacity at end of test was > than C ₁ .	
Short-circuit Current	DO-293A, 2.7 IEC 60952-1, 5.7	Peak current = 2398 A Last recorded current = 7.1 A @ 3.09 seconds	
Charge Acceptance	DO-293A, 2.8 IEC 60952-1, 5.8	+23°C = 103% 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	Insulation resistance is greater than 2000 MΩ when subjected to 250VDC between the positive terminal and the points of attachment.	
Dielectric Strength	DO-293A, 2.9.2 IEC 60952-1, 5.9.2	Battery shows no evidence of arcing or breakdown of insulation when subjected to 1500VAC rms at 50 Hz for 1m between each battery terminal and the case.	
Duty Cycle Performance	DO-293A, 2.10 IEC 60952-1, 5.10	OK. 100 cycles of engine start sequence.	
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 93 % of its initial capacity.	
Induced Destructive Overcharge	DO-293A, 2.14 IEC 60952-1, 5.15	There was no explosion or fire. 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	RG-220 was tested and qualified per DO-293A to DO-160G, random vibration test per Curve C (4.12 G _{RMS}), Section 8, 1 hour per axis.	
Acceleration	DO-293A, no requirement IEC 60952-1, 6.2	Not tested	

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Operational Shock	DO-293A, 3.3.1 IEC 60952-1, 6.3, Class I	RG-220 was tested and qualified per DO-293A to DO-160G, Category B. All shock pulses were of a saw tooth configuration. Each shock pulse had an amplitude of 6g's for 11ms.	
Crash Safety Shock	DO-293A, 3.3.2 IEC 60952-1, 6.4	RG-220 was tested and qualified per DO-293A to DO-160G, Category B, impulse and sustained. Impulse shock pulses were of the saw tooth configuration. Each shock pulse had an amplitude of 20g's for 11ms. The battery was tested per DO-160 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	N/A	
Altitude	DO-293A, 3.5 IEC 60952-1, 6.6	RG-220 was tested and qualified to DO-293A. RG-220 was test to 20621m (67654 ft.)	
Rapid Decompression	DO-293A, 3.5.2 IEC 60952 no requirement	RG-220 was tested and qualified to DO-293A. RG-220 was tested from 2300m (8000 ft.) to 20621m (67654 ft.)	
Temperature Shock	DO-293A, 3.6 IEC 60952-1, 6.7	RG-220 was tested and qualified per DO-293A. Temperature cycles were from +85°C to -55°C.	
Fungus Resistance	DO-293A, 3.7 IEC 60952-1, 6.8	Component test. Test was performed on representative material samples per DO-160E, Category F. All samples successfully met the test requirements.	
Humidity	DO-293A, 3.8 IEC 60952-1, 6.9	The RG-220 was tested and qualified per DO-293A to DO-160G, Category B.	
Fluid Contamination	DO-293A, 3.9 IEC 60952-1, 6.10	<p>Component test. Test was performed on representative material samples. All samples successfully met the test requirements.</p> <p>Fluids tested:</p> <p>Fuels.</p> <ul style="list-style-type: none"> Aviation Jet A fuel Aviation piston engine fuel (100LL AVGAS) <p>Hydraulic fluids</p> <ul style="list-style-type: none"> Mineral based (MIL-H-5606) Non-mineral based synthetic (MIL-PRF-83282 and MIL-PRF-87257) <p>Lubricating oils</p> <ul style="list-style-type: none"> Mineral based (MIL-L-6081) Ester based synthetic (MIL-L-23699) Internal combustion engine SAE 15W40 <p>Solvents and cleaning fluids</p> <ul style="list-style-type: none"> Isopropyl alcohol (TT-I-735) Denatured alcohol <p>De-icing fluid</p> <ul style="list-style-type: none"> Ethylene Glycol Propylene Glycol AMS 1424 (SAE AEA Type I) 	

Characteristic	RTCA DO-293A IEC 60952-1	Requirement/Performance	Test Report / Reference
		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	The RG-220 was tested and qualified per DO-293A to DO-160G, Category S.	
Physical Integrity at High Temperature	DO-293A, 3.11 IEC 60952-1, 6.12	RG-220 was tested and qualified per DO-293A. After 16h at 85EC sample successfully met the test requirements.	
Flammability	DO-293A, no requirement IEC 60952-1, 6.13	Not tested.	
Electrolyte Resistance	DO-293A, 3.12 IEC 60952-1, 6.14	Component test. All component parts which come in contact with electrolyte are tested to this requirement as part of component qualification. 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 used in this battery are identical or sufficiently similar to components which have previously been tested to these requirements and successfully met the performance requirements of the test.	
Battery Airtightness	DO-293A, no requirement IEC 60952-1, 6.17	N/A	
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	N/A	
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
Title or Function: Sr. Vice President Engineering