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Concorde Battery Corporation
2009 San Bernardino Road
West Covina, California, USA 27106

RG-441 & RG-442

24 VOLT 44.0 Ah, VALVE REGULATED, LEAD-ACID, AIRCRAFT BATTERY

DECLARATION OF DESIGN PERFORMANCE

TO THE REQUIREMENTS OF

RTCA DO-293 and IEC 60952

Applications: Engine Starting and Emergency Power

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

The item or Technical Data contained herein has been reviewed and approved for general release on the basis that it contains no Export-controlled information.

Characteristic	Part / Clause	Requirement/Performance	Test Report / Reference
Description	The RG-441 and RG-442 are both 24 volt valve regulated lead acid batteries designed for engine starting and emergency power. Both batteries consists of twelve 2 volt cells connected in series. These cells are housed in a polypropylene container and cover. The twelve cells are connected in series using an intercell strap pack per connection. The intercell strap pack consists of a stack of beryllium copper alloy straps. The intercell strap packs are fixed to the monoblock terminals with brass hex head screws. The negative terminal is connected using 2 AWG cable to an MS3509 type receptacle. The positive terminal is connected to the same receptacle with the use of a stack of beryllium copper alloy straps shaped for their intended use or a woven copper mesh with a cross-sectional area equivalent to 2 AWG. The complete monoblock assembly is housed within an epoxy fusecoated aluminum case and cover. The cells are held down within the case by two aluminum hold downs. These hold downs are placed against the top of the monoblock and riveted to the side walls of the case restricting the monoblock from moving within the housing. The cover and monoblock hold downs are attached to the case using high retention rivets. The RG-441 and RG-442 both have two polypropylene strap handles and one aluminum handle. The two polypropylene handles are located on the top cover and the aluminum handle is located on the face of the battery case. An angle bracket hold down for the RG-441 battery is located on the lower front and lower back of the case. The bracket is fully welded to the casing. The hold downs for the RG-442 are located on the bottom front and back of the case. At the back there are two stainless steel pins and at the front there are two MS14108-12C locks. The aluminum outer housing for both batteries are equipped with a cutout for the placement of a temperature sensor. The RG-441 is fitted for this test series with a TS-C3 temperature sensor and the RG-442 is fitted with a TS-C4 temperature sensor. Both battery housings are equipped with vent tubes. The RG-441 is electrically identical to the RG-442. Both contain the same type cells and electrical components and wiring. Therefore electrical testing conducted on the RG-441 will be representative of the RG-442 and vice versa. The outer housing and construction of the two battery types are sufficiently similar that tests completed on one may be considered to represent the other and vice versa.		
Format	IEC 60952-2	Concorde Drawing No. RG-441 and RG-442	
Connector	IEC 60952-2	The battery is equipped with an IEC Type Q (MS3509) connector	
Mass		RG-441 - 39.0 Kg (86.0 lbs) Max RG-442 - 39.0 Kg (86.0 lbs) Max	
Charging method	IEC 60952-1, 4.3	Constant potential at 28.25 VDC ± 0.25 VDC	
Any auxiliary requirement:	N/A	The RG-441 and RG-442 batteries are both equipped with a mounting plate for the attachment of a temperature sensor.	
Ventilation	DO-293, 2.2.2 IEC 60952-2	The RG-441 and RG-442 batteries are both equipped with vent tubes.	
Flammability	IEC 60952-2	The RG-441 and RG-442 outer containers are fire resistant.	
Unspillability		Non spill	
Electrical Performance			
Rated Capacity (C_1)	DO-293, 2.2.2 IEC 60952-1, 5.1.1	44 Ah	
Capacity at –18°C	DO-293, 2.2.3 IEC 60952-1, 5.1.2	27 Ah	
Capacity at –30°C	DO-293, 2.2.4 IEC 60952-1, 5.1.3	18 Ah	
Capacity at +50°C	DO-293, 2.2.5 IEC 60952-1, 5.1.4	50 Ah	

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Power Rating +23°C	DO-293, 2.2.6.1 IEC 60952-1, 5.2.1.1	Ipp = 1025 A Ipr = 860 A	
Power Rating -18°C	DO-293, 2.2.6.2 IEC 60952-1, 5.2.1.2	Ipp = 825 A Ipr = 680 A	
Power Rating -30°C	DO-293, 2.2.6.3 IEC 60952-1, 5.2.1.3	Ipp = 675 A Ipr = 560 A	
Rapid Discharge Capacity at 23°C	DO-293, 2.3.1 IEC 60952-1, 5.3.1	27 Ah	
Rapid Discharge Capacity at -30°C	DO-293, 2.3.2 IEC 60952-1, 5.3.2	8 Ah	
Charge Retention	DO-293, 2.4 IEC 60952-1, 5.4	23°C - Rating value for design = 85 % 50°C - Rating value for design = 80 %	
Storage	DO-293, 2.5 IEC 60952-1, 5.5	Testing in progress.	
Charge Stability	DO-293, 2.6 IEC 60952-1, 5.6, Class I	Max battery temperature on charge = 52.0 C. Charge current fell during the entire charge period. Capacity at end of test was greater than the C_1 rate.	
Short-circuit Current	DO-293, 2.7 IEC 60952-1, 5.7	Battery met all test requirements: Peak current: 2829 A Last Current: 990 A at 4 sec	
Charge Acceptance	DO-293, 2.8 IEC 60952-1, 5.8	+23 C = 102 % -18 C (battery with heaters only) N/A -40 C (battery with heaters only) N/A	
Insulation Resistance	DO-293, 2.9.1 IEC 60952-1, 5.9.1	All samples met the test requirements.	
Dielectric Strength	DO-293, 2.9.2 IEC 60952-1, 5.9.2	All samples met the test requirements.	
Duty Cycle Performance	DO-293, 2.10 IEC 60952-1, 5.10	100 cycle requirement successfully completed.	
Water Consumption	DO-293, 2.11 IEC 60952-1, 5.11	N/A, applies to flooded electrolyte batteries only.	
Overcharge Endurance	DO-293, no requirement IEC 60952-1, 5.12	Not tested	
Cyclic Endurance	DO-293, 2.12 IEC 60952-1, 5.13	100 cycle requirement successfully completed.	
Deep Discharge	DO-293, 2.13 IEC 60952-1, 5.14	All test requirements were met.	
Induced Destructive Overcharge	DO-293, 2.14 IEC 60952-1, 5.15	All test requirements were met.	
Electrical Emissions	DO-293, 2.15 IEC 60952-1, 5.16	N/A, battery contains no active electronics.	

Characteristic	Part / Clause	Requirement/Performance	Test Report / Reference
Environmental Performance			
Vibration	DO-293, 3.1 IEC 60952-1, 6.1	Subjected to the random vibration test per Curve C, section 8 of DO-160E, 1 hr per axis. All batteries met the vibration test requirements.	
Acceleration	DO-293, no requirement IEC 60952-1, 6.2	Not tested	
Operational Shock	DO-293, 3.3.1 IEC 60952-1, 6.3, Class I	Subjected to Category B of DO-160E. All batteries met the Operational Shock test requirements.	
Crash Safety Shock	DO-293, 3.3.2 IEC 60952-1, 6.3	Subjected to Category B, DO-160E. The sustained shocks were performed at an acceleration of 20g's in all directions for 3 sec in each. All batteries met the crash safety test requirements.	
Explosion Containment	DO-293, 3.4 IEC 60952-1, 6.4	All batteries met the test requirements.	
Altitude	DO-293, 3.5 IEC 60952-1, 6.6	Tested to 20,621m (67,654 ft).	
Rapid Decompression	DO-293, 3.5.2 IEC 60952 no requirement	Tested from 2,300m (8,000 ft) to 20,621m (67,654 ft).	
Temperature Shock	DO-293, 3.6 IEC 60952-1, 6.7	All batteries met the requirements.	
Fungus Resistance	DO-293, 3.7 IEC 60952-1, 6.8	DO-160E Category F. All samples successfully met the test requirement.	
Humidity	DO-293, 3.8 IEC 60952-1, 6.9	Tested to DO-160E, Category B.	

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Fluid Contamination	DO-293, 3.9 IEC 60952-1, 6.10	Test was performed on representative material samples. All samples successfully met the test requirement. ***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 II) Insecticides - none Sullage - none Disinfectants (heavy duty phenolics) - none Coolant dielectric fluid - none Fire extinguishants - none	
Salt Spray	DO-293, 3.10 IEC 60952-1, 6.11	Tested to DO-160E category S. All batteries successfully met the test requirements.	
Physical Integrity at High Temperature	DO-293, 3.11 IEC 60952-1, 6.12	All batteries met the test requirements.	
Flammability	DO-293, 3.12 IEC 60952-1, 6.14	Not tested. See section 1.	
Electrolyte Resistance	DO-293, 3.13 IEC 60952-1, 6.15	All components met the specification requirements.	
Thermal Sensors	DO-293, 3.13 IEC 60952-1, 6.15	The TS-C3 and TS-C4 met the test requirements.	
Component Qualification tests	DO-293, 3.14 IEC 60952-1, 6.16	All components met the specification requirements.	
Battery Airtightness	DO-293, no requirement IEC 60952-1, 6.17	N/A	
Cell Baffle	DO-293, no requirement IEC 60952-1, 6.18	N/A, applies only to nickel-cadmium batteries only.	

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Strength of Receptacle	DO-293, 3.15 IEC 60952-1, 6.19	Ok.	
Handle Strength	DO-293, 3.16 IEC 60952-1, 6.20	Ok.	

N/A = Not Applicable

Authentication:

Manufacturer. Concorde Battery Corporation.

John B. Timmons, PE

Digitally signed by John B. Timmons, PE
DN: CN = John B. Timmons, PE, C = US, O = Concorde Battery Corporation, OU = Vice President Engineering
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Signed: .....
Name of signatory: John B. Timmons, PE
Title or Function: Vice President Engineering