



Concorde Battery Corporation

2009 San Bernardino Road
West Covina, California, USA 91790

RG-445 Series

24 VOLT 18 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-445 Series are 24 volt 18 Ah valve regulated lead-acid batteries designed for engine starting and emergency power.</p> <p>The monoblock consists of 12 series connected cells. The cells are enclosed by a one piece plastic container and a plastic one piece cover which is secured to the container with epoxy cement. The container and cover are made of high-impact polypropylene. The monoblock is encased in an outer housing of fuse coated aluminum. The outer housing provides the assembly with increased protection from fire with the aluminum housing being fire resistant. The battery hold down and ventilation connections are incorporated into the metal container of the battery.</p> <p>The RG-445 Series batteries are identical with the exception of the connector. The letter at the end of the battery part number indicates the connector style.</p> <p>RG-445E – Equipped with an IEC-952 Type Q terminal connector conforming to MS3509.</p> <p>RG-445C – Equipped with an IEC-952 Type C terminal connector conforming to MS3349.</p> <p>The RG-445C is mechanically and electrically identical to the Qualified Products Listed (QPL) military specification, D8565/8-1 battery.</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-445E Concorde Drawing No. RG-445C	
Connector	IEC 60952-2	RG-445E - Equipped with an IEC-952 Type Q terminal connector conforming to MS3509. RG-445C - Equipped with an IEC-952 Type C terminal connector conforming to MS3349.	
Mass		RG-445E & RG-445C – 19.5 kg Max (43.0 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	RG-445 Series is equipped with 2 external threaded vent tubes. Thread is M12 X 1.75-8G	
Flammability	IEC 60952-2	RG-445 Series outer container is fire resistant.	
Spillability		Non spill	
Electrical Performance			
Rated Capacity (C1)	DO-293A, 2.2.2 IEC 60952-1, 5.1.1	18 Ah	
Capacity at B18EC	DO-293A, 2.2.3 IEC 60952-1, 5.1.2	15 Ah when discharged at the C ₁ rate.	
Capacity at B30EC	DO-293A, 2.2.4 IEC 60952-1, 5.1.3	11 Ah when discharged at the C ₁ rate.	

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Capacity at +50EC	DO-293A, 2.2.5 IEC 60952-1, 5.1.4	18 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} = 1050 A, I _{pr} = 775 A	
Power Rating -18EC	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.2	I _{pp} = 700 A, I _{pr} = 575 A	
Power Rating -30EC	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.3	I _{pp} = 550 A, I _{pr} = 375 A	
Rapid Discharge Capacity at 23EC	DO-293A, 2.3.1 IEC 60952-1, 5.3.1	11 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.	
Charge Retention	DO-293A, 2.4 IEC 60952-1, 5.4	+23°C - Rating value for design = 90 %	
		+50°C - Rating value for design = 55 %	
Storage	DO-293A, 2.5 IEC 60952-1, 5.5	DO-293 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 = 58EC. 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 = 2217 A Last recorded current = 9 A at 60 seconds	
Charge Acceptance	DO-293A, 2.8 IEC 60952-1, 5.8	+23°C = 107%	
		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. 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.	

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Deep Discharge	DO-293A, 2.13 IEC 60952-1, 5.14	After sitting in a discharged condition for 4 weeks: Battery recovered 101 % 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-445E 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	
Operational Shock	DO-293A, 3.3.1 IEC 60952-1, 6.3, Class I	RG-445E 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-445E 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	RG-445E was tested and qualified per DO-293A to DO-160G. All debris was contained within the outer container of the battery and there was no subsequent ignition of the battery.	
Altitude	DO-293A, 3.5 IEC 60952-1, 6.6	RG-445E was tested and qualified to 20621m (67654 ft.) per DO-293A.	
Rapid Decompression	DO-293A, 3.5.2 IEC 60952 no requirement	RG-445E was tested and qualified from 2300m (8000 ft.) to 20621m (67654 ft.) per DO-293A.	
Temperature Shock	DO-293A, 3.6 IEC 60952-1, 6.7	RG-445E 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-445E was tested and qualified per DO-293A to DO-160G, Category B.	
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)	

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		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	The RG-445E 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-445E 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	OK	

Characteristic	RTCA DO-293A IEC 60952-1	Requirement/Performance	Test Report / Reference
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

