Concorde Battery Corporation

2009 San Bernardino Road
West Covina, California, USA 27106

RG-145 Series

24 VOLT 17 Ah, VALVE REGULATED, LEAD-ACID, AIRCRAFT BATTERY

DECLARATION OF DESIGN PERFORMANCE

TO THE REQUIREMENTS OF

RTCA DO-293 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-293 IEC 60952-1	Requirement/Performance	Test Report / Reference
Description	The RG-145 series are 24 volt valve regulated lead acid batteries designed for engine starting and emergency power. Consisting of two types: The RG-145-2 and RG-145-1. The RG-145-2 is an RG-145-1 with the addition of a heater blanket and thermal switches. All test results gathered on the RG-145-2 (with heater deactivated) are considered representative of the RG-145-1 with no further testing. Both RG-145 types contain two MB12-17AA monoblocks. Each MB12-17AA 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 monoblocks are connected in series using a copper strap. The monoblock assembly is housed within a fuse-coated aluminum container and cover. The cover is connected to the container using high retention rivets. An MS3509 conforming receptacle is incorporated into the outer housing. A hold down bar is integrated into the cover. A polypropylene handle assembly for lifting the battery is fitted around the cover. Vent tubes are integrated into the container. 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. Both RG-145 types contain the same monoblocks as those in the RG-222, therefore all electrical test results on the RG-222 are considered representative of the RG-145 series. Many environmental test results from the RG-222 may also be considered representative of the RG-145 series due to similarities in material and construction. The RG-145 Series conforms to Concorde envelope drawing RG-145 Series and assembly drawing CB-00412.		
Format	IEC 60952-2	Concorde Drawing No. RG-145 Series	
Connector	IEC 60952-2	The battery is available with a Type Q terminal conforming to MS-3509.	
Mass		RG-145-1 – 42.5 lbs Max (19.7 kg). RG-145-2 – 42.5 lbs Max (19.7 kg).	
Charging method	IEC 60952-1, 4.3	Constant potential at 28.25 V	
Any auxiliary requirement:		None	
Ventilation	DO-293, 1.9 IEC 60952-2	Battery is equipped with vent hole.	
Flammability	IEC 60952-2	The RG-145 series outer container is fire resistant.	
Spillability		Non spill	
Electrical Performance			
Rated Capacity (C1)	DO-293, 2.2.2 IEC 60952-1, 5.1.1	17 Ah	
Capacity at –18°C	DO-293, 2.2.3 IEC 60952-1, 5.1.2	11.0 Ah when discharged at the C1 rate. RG-145-2, 17 Ah with heater activated for 1 hour prior to test.	
Capacity at –30°C	DO-293, 2.2.4 IEC 60952-1, 5.1.3	8.0 Ah when discharged at the C1 rate. RG-145-2, 13 Ah with heater activated for 1 hour prior to test.	

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Capacity at +50°C	DO-293, 2.2.5 IEC 60952-1, 5.1.4	18.0 Ah when discharged at the C1 rate.	
Power Rating +23°C	DO-293, 2.2.6.1 IEC 60952-1, 5.2.1.1	Ipp = 900 A, Ipr = 625 A	
Power Rating -18°C	DO-293, 2.2.6.2 IEC 60952-1, 5.2.1.2	Ipp = 600 A, Ipr = 425 A	
Power Rating -30°C	DO-293, 2.2.6.3 IEC 60952-1, 5.2.1.3	Ipp = 450 A, Ipr = 300 A	
Rapid Discharge Capacity at 23°C	DO-293, 2.3.1 IEC 60952-1, 5.3.1	10.0 Ah when discharged at 10 times the C1 rate to 10 volts.	
Rapid Discharge Capacity at -30°C	DO-293, 2.3.2 IEC 60952-1, 5.3.2	3.5 Ah when discharged at 10 times the C1 rate to 10 volts. RG-145-2, 10 Ah with heater activated for 1 hour prior to test.	
Charge Retention	DO-293, 2.4 IEC 60952-1, 5.4	+23 C - retained capacity = 16.4 AH, 92% Rating value for design = 90 %	
		+50 C - retained capacity = 9.6 AH, 55% Rating value for design = 50 %	
Storage	DO-293, 2.5 IEC 60952-1, 5.5	DO-293 - 1 year storage life test completed on RG-222. Initial capacity after test was 14.25Ah. Capacity increased after subsequent charge and discharge cycles to 18.23 Ah. Battery also completed 100 cycles IAW Duty Cycle Performance test procedures. The RG-145 series is qualified based on similarity to the RG-222.	
Charge Stability	DO-293, 2.6 IEC 60952-1, 5.6, Class I	OK. Max battery temperature on charge = 50°C. Charge current fell during the charge period. Capacity at end of test > C1	
Short-circuit Current	DO-293, 2.7 IEC 60952-1, 5.7	Peak current = 1832 A Last recorded current = 850 A at 3.8s	
Charge Acceptance	DO-293, 2.8 IEC 60952-1, 5.8	+23 C = 103%	
		-18 C = 107% (Heater Active)	
		-40 C = 168% (Heater Active)	
Insulation Resistance	DO-293, 2.9.1 IEC 60952-1, 5.9.1	All samples successfully met the test requirement.	
Dielectric Strength	DO-293, 2.9.2 IEC 60952-1, 5.9.2	All samples successfully met the test requirement.	
Duty Cycle Performance	DO-293, 2.10 IEC 60952-1, 5.10	100 cycles successfully completed.	
Water Consumption Test	DO-293, 2.11 IEC 60952-1, 5.11	N/A	
Overcharge Endurance	DO-293, no requirement IEC 60952-1, 5.12	Not tested	

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Cyclic Endurance	DO-293, 2.12 IEC 60952-1, 5.13	100 cycles successfully completed.	
Deep Discharge	DO-293, 2.13 IEC 60952-1, 5.14	The RG-145 Series successfully met the test requirement.	
Induced Destructive Overcharge	DO-293, 2.14 IEC 60952-1, 5.15	The RG-145 Series successfully met the test requirement.	
Electrical Emissions	DO-293, 2.15 IEC 60952-1, 5.16	N/A Battery contains no active electronics.	
Environmental Performance			
Vibration	DO-293, 3.1 IEC 60952-1, 6.1	Qualified to DO-293 and DO-160E, Random Vibration test per Curve C, section 8, 1 hour per axis.	
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	The RG-222 qualified to DO-293 and DO-160E, Category B. The RG-145 series is sufficiently similar to the RG-222 that test results are considered representative. The RG-145 series is therefore qualified based on similarity to the RG-222.	
Crash Safety Shock	DO-293, 3.3.2 IEC 60952-1, 6.4	Qualified to DO-293 and DO-160E, Category B, impulse and sustained. Sustained per DO-160E Table 7-1, Aircraft type 5, Test type R, 20g's in each orientation.	
Explosion Containment	DO-293, 3.4 IEC 60952-1, 6.5	Qualified to DO-293 and DO-160E. The RG-145 Series successfully met the test requirement.	
Altitude	DO-293, 3.5 IEC 60952-1, 6.6	The RG-222 has been qualified to 20621m (67654 ft) IAW DO-293. The RG-145 series is sufficiently similar to the RG-222 that test results are considered representative. The RG-145 series is therefore qualified based on similarity to the RG-222. Tested to 20621m (67654 ft) IAW DO-293.	
Rapid Decompression	DO-293, 3.5.2 IEC 60952 no reqmt	The RG-222 has been qualified from 2300m (8000 ft) to 20621m (67654 ft) IAW DO-293. The RG-145 series is sufficiently similar to the RG-222 that test results are considered representative. The RG-145 series is therefore qualified based on similarity to the RG-222.	
Temperature Shock	DO-293, 3.6 IEC 60952-1, 6.7	Tested from +85°C to -55°C IAW DO-293. The sample successfully met the test requirement.	
Fungus Resistance	DO-293, 3.7 IEC 60952-1, 6.8	Qualified to DO-293 and DO-160E Category F. All samples successfully met the test requirement.	
Humidity	DO-293, 3.8 IEC 60952-1, 6.9	The RG-222 has been qualified to DO-293 and DO-160E, Category B. The RG-145 series is sufficiently similar to the RG-222 that test results are considered representative. The RG-145 series is therefore qualified based on similarity to the RG-222.	

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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 VI) 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	The RG-222 has been qualified to DO-293 and DO-160E, Category S. The RG-145 series is sufficiently similar to the RG-222 that test results are considered representative. The RG-145 series is therefore qualified based on similarity to the RG-222.	
Physical Integrity at High Temperature	DO-293, 3.11 IEC 60952-1, 6.12	The RG-222 has been qualified to DO-293. After 16h at 85°C sample successfully met the test requirement. The RG-145 series is sufficiently similar to the RG-222 that test results are considered representative. The RG-145 series is therefore qualified based on similarity to the RG-222.	
Flammability	DO-293, no requirement IEC 60952-1, 6.13	Not tested. See Section 1	
Electrolyte Resistance	DO-293, 3.12 IEC 60952-1, 6.14	All samples met the specification requirements.	
Thermal Sensors	DO-293, 3.13 IEC 60952-1, 6.15	All thermal sensors functioned as designed.	

Characteristic	RTCA DO-293 IEC 60952-1	Requirement/Performance	Test Report / Reference
Component Qualification tests	DO-293, 3.14 IEC 60952-1, 6.16	All components successfully met the test requirement.	
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.	
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
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