



Concorde Battery Corporation

2009 San Bernardino Road
West Covina, California, USA 91790

RG-380E/53 Series

24 VOLT 53 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-380E/53 series of batteries are 24 volt 53 Ah valve regulated lead-acid batteries designed for engine starting and emergency power. Within this series there are four versions. All versions are electrically identical. Each contain the identical monoblock but with various outer containers.</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 an epoxy cement. The container and cover are made of high-impact polypropylene. Each monoblock is equipped with an integrally molded quick disconnect connector dimensionally conforming to MS3509. 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> <p>Two of the versions, the 'L' and the 'K', are encased in an outer housing of fuse coated aluminum. Two of the versions, the 'LS' and the 'KS', are encased in an outer housing of stainless steel. The outer housings provide the assembly with increased protection from fire with the aluminum housing being fire resistant and the stainless steel housing being fire proof. The battery hold down is incorporated into the metal cover of the battery and are identical for all versions. The metal cased batteries of the 'L' and 'LS' versions also provide an aperture for the mounting of a temperature sensor if required by the aircraft configuration. The 'K' and 'L' series differ in the 'K' series having louvers instead of vent tubes as on the 'L' series.</p> <p>The RG-380E/60 series and RG-380E/44 series are substantially similar to the RG-380E/53 series. All external housings for the 'L', 'K', 'LS' and 'KS' versions are identical. The three series are substantially identical mechanically that several environmental test results may be considered representative of the RG-380E/53 series. Electrically the three series are not sufficiently similar to allow test results to be representative.</p>		
Format	IEC 60952-2	Concorde Drawing No. RG-380E/53L, RG-380E/53LS, RG-380E/53K, RG-380E/53KS	
Connector	IEC 60952-2	The battery is equipped with a Type Q terminal conforming to MS3509.	
Mass		RG-380E/53L - 43.5 kg Max (96.0 lbs). RG-380E/53LS - 44.5 kg Max (98.0 lbs). RG-380E/53K - 43.5 kg Max (96.0 lbs). RG-380E/53KS - 44.5 kg Max (98.0 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-380E/53L is equipped with vent tubes RG-380E/53LS is equipped with vent tubes RG-380E/53K is equipped with vent louvers RG-380E/KS is equipped with vent louvers	
Flammability	IEC 60952-2	RG-380E/53L and RG-380E/53K outer container is fire resistant. RG-380E/53LS and RG-380E/53KS outer container is fire proof.	
Spillability		Non spill	
Electrical Performance			
Rated Capacity (C1)	DO-293A, 2.2.2 IEC 60952-1, 5.1.1	53 Ah	

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Capacity at -18°C	DO-293A, 2.2.3 IEC 60952-1, 5.1.2	20 Ah when discharged at the C ₁ rate.	
Capacity at -30°C	DO-293A, 2.2.4 IEC 60952-1, 5.1.3	15 Ah when discharged at the C ₁ rate.	
Capacity at +50°C	DO-293A, 2.2.5 IEC 60952-1, 5.1.4	55 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} = 1650 A, I _{pr} = 1200 A	
Power Rating -18°C	DO-293A, 2.2.6.2 IEC 60952-1, 5.2.1.2	I _{pp} = 1325 A, I _{pr} = 1000 A	
Power Rating -30°C	DO-293A, 2.2.6.3 IEC 60952-1, 5.2.1.3	I _{pp} = 1125 A, I _{pr} = 800 A	
Rapid Discharge Capacity at 23°C	DO-293A, 2.3.1 IEC 60952-1, 5.3.1	9.4 Ah when discharged at 10 times the C ₁ rate to 10 volts.	
Rapid Discharge Capacity at -30°C	DO-293A, 2.3.2 IEC 60952-1, 5.3.2	7 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 = 52.5°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 = 3533 A Last recorded current = 83 A at 4.2 s	
Charge Acceptance	DO-293A, 2.8 IEC 60952-1, 5.8	+23°C = 100%	
		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-380E/53 Series successfully met the test requirements.	
Dielectric Strength	DO-293A, 2.9.2 IEC 60952-1, 5.9.2	The RG-380E/53 Series 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	

Characteristic	RTCA DO-293A IEC 60952-1	Requirement/Performance	Test Report / Reference
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 91% 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	RG-380E/53L was tested and qualified per DO-293A to DO-160G, random vibration test per Curve C, section 8, 1 hour per axis. The RG-380E/53L is considered representative of the RG-380E/53K, RG-380E/53KS and RG-380E/53LS based on equivalency.	
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-380E/53L was tested and qualified per DO-293A to DO-160G, Category B. An RG-380E/60LS was tested and qualified per DO-293 to DO-160E, Category B. All shock pulses were of a saw tooth configuration. Each shock pulse had an amplitude of 6g's for 11ms. The RG-380E/53L is considered representative of the RG-380E/53K based on equivalency. The RG-380E/60LS is considered representative of the RG-380E/53LS and RG-380E/53KS based on equivalency.	
Crash Safety Shock	DO-293A, 3.3.2 IEC 60952-1, 6.4	RG-380E/53L was tested and qualified per DO-293A to DO-160G, Category B, impulse and sustain. An RG-380E/60LS was tested and qualified per DO-293, Category B. Impulse shock pulses were of the saw tooth configuration. The battery was tested per DO-160 Table 7-1, Aircraft type 5, Test type R, 20g's in each orientation. The RG-380E/53L is considered representative of the RG-380E/53K based on equivalency. The RG-380E/60LS is considered representative of the RG-380E/53LS and RG-380E/53KS based on equivalency.	
Explosion Containment	DO-293A, 3.4 IEC 60952-1, 6.5	RG-380E/53L 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. The RG-380E/53L is considered representative of the RG-380E/53LS, RG-380E/53K and RG-380E/53KS based on equivalency.	
Altitude	DO-293A, 3.5 IEC 60952-1, 6.6	RG-380E/53L was tested and qualified to 20621m (67654 ft) per DO-293A. The RG-380E/53L is considered representative of the RG-380E/53LS, RG-380E/53K and RG-380E/53KS based on equivalency.	

Characteristic	RTCA DO-293A IEC 60952-1	Requirement/Performance	Test Report / Reference
Rapid Decompression	DO-293A, 3.5.2 IEC 60952 no reqmt	RG-380E/53L was tested and qualified from 2300m (8000 ft) to 20621m (67654 ft) per DO-293A. The RG-380E/53L is considered representative of the RG-380E/53LS, RG-380E/53K and RG-380E/53KS based on equivalency.	
Temperature Shock	DO-293A, 3.6 IEC 60952-1, 6.7	RG-380E/53L was tested and qualified per DO-293A. The RG-380E/53L is considered representative of the RG-380E/53K based on equivalency. An RG-380E/44LS was tested and qualified per DO-293. The RG-380E/44LS is considered representative of the RG-380E/53LS and RG-380E/53KS based on equivalency. Temperature cycles were 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-160E, Category F.	
Humidity	DO-293A, 3.8 IEC 60952-1, 6.9	The RG-380E/44L and RG-380E/44LS were tested and qualified per DO-293 to DO-160, Category B. DO-293 humidity testing is equivalent to DO-293A. The RG-380E/44L and RG-380E/44LS are considered representative of the RG-380E/53L, RG-380E/53LS, RG-380E/53K and RG-380E/53KS based on equivalency.	

Characteristic	RTCA DO-293A IEC 60952-1	Requirement/Performance	Test Report / Reference
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	The RG-380E/44L and RG-380E/44LS were tested and qualified per DO-293A to DO-160G, Category S. The RG-380E/44L and RG-380E/44LS are considered representative of the RG-380E/53L, RG-380E/53LS, RG-380E/53K and RG-380E/53KS based on equivalency.	
Physical Integrity at High Temperature	DO-293A, 3.11 IEC 60952-1, 6.12	RG-380E/53L was tested and qualified per DO-293A. After 16h at 85°C sample successfully met the test requirements. The RG-380E/53L is considered representative of the RG-380E/53LS, RG-380E/53K and RG-380E/53KS based on equivalency.	
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 components met the specification requirements.	
Thermal Sensors	DO-293A, 3.13 IEC 60952-1, 6.15	N/A	

Charge Acceptance at 23°C

